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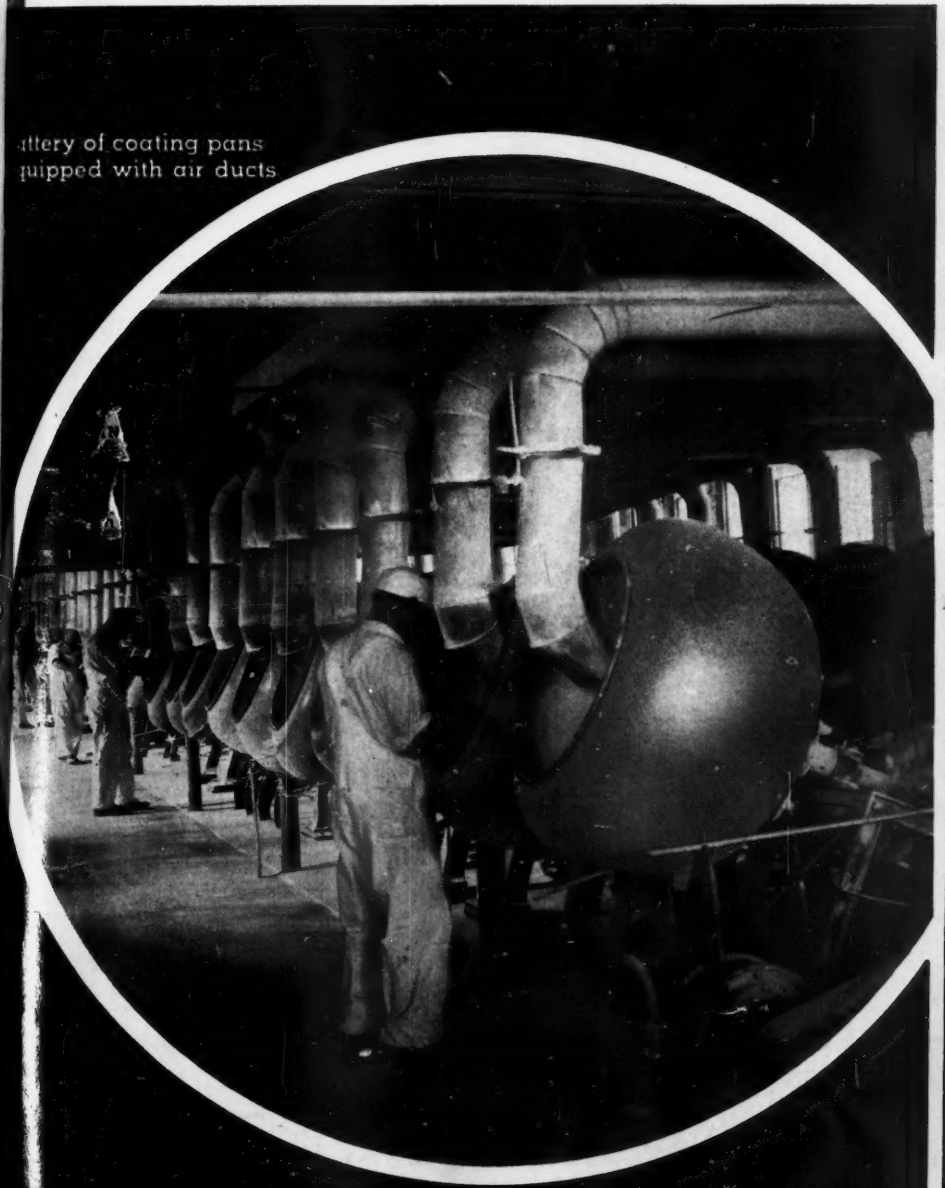
FOOD INDUSTRIES

● FOR THOSE WHO CONTROL QUALITY THROUGH MANAGEMENT AND PRODUCTION



attery of coating pans quipped with air ducts

JANUARY 1945

The Philosophy Of a Food Artist

"Stinkometer" —New Quality Tool

Freeze-Drying— Technology, Costs

Research Solves Egg Drying Problems

Safe Practices With High Pressures

History, Technology Of Agar Manufacture

Keeping Up With Rulings on Wages

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THE COVER

Part of a battery of 80 revolving pans used for sugar-coating chewing gum. Sugar sirup applied while the pieces tumble in the pans is dried by conditioned air supplied through the overhead ducts. Rubbing of the pieces against each other and against the pan gives them a smooth surface.

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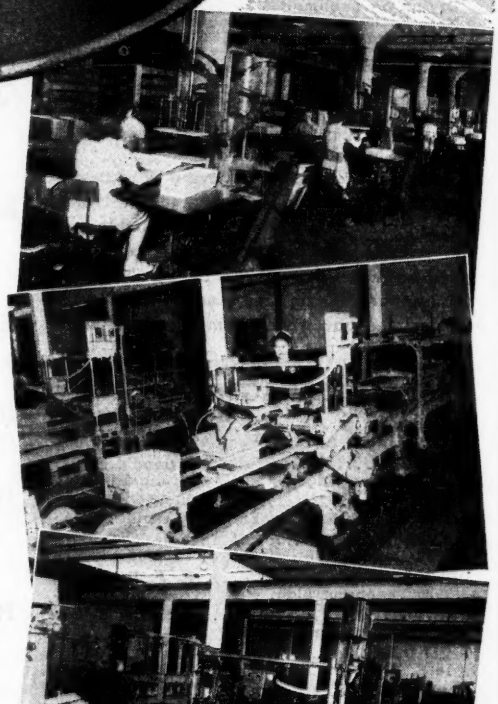

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WHAT'S AHEAD IN 1945

It looks like a fairly good year for the food industries in respect to volume, earnings and employment. But there are many variables in the long-range outlook. Here the telescope is turned on the more important of them

BARRING an unexpected early collapse of Japan or a severe drought in 1945, all things look fairly favorable for the food industry to continue its 1944 record—whether you measure it as volume of goods, earnings or employment. If Germany collapses in 1945 but Japan continues fighting, the orderly transition of food processing to a peace basis will be so smooth that it will not attract outside attention.

But too much depends on V-E Day and the probable changes that the government has said it will initiate in a matter of days—nay, even hours—after Germany is defeated to permit a clear-cut long-range forecast. Ditto for V-J Day.

Unless government plans should be materially altered (which is quite likely), the defeat of Germany automatically starts a whole series of actions of far-reaching consequence. These actions are the cessation of manufacture of many war supplies and reconversion of industrial facilities to the ways of peace, leaving only enough war production going on to insure the defeat of Japan by highly "industrialized" warfare.

Employment After V-E Day

From all the talk in Washington, one would think that the reconversion of industry would easily absorb all the workers who will be laid off on V-E Day or within 30 days thereafter. It has been said, as recently as last September, that 53,000,000 persons will want jobs within six months after V-E Day. And the National Association of Manufacturers in December bravely put out its survey showing that 95 percent of all industry can complete its reconversion within eight weeks after V-E Day and that 75 percent can reach peak production within that period. All of this is very good, and insures a minimum of industrial unemployment in the transition from war on two fronts to war on one front. But less than 25 percent of all peacetime jobs are provided by manufacturing industry. Service industries and agriculture supplied the jobs for about 77 percent of the workers in 1940.

The rate of transition from two-front war to one-front war and the speed with which the displaced workers can find other jobs will have a very important bearing on the food-price structure. When people are out of jobs, they will economize to an astonishing extent. And they will subsist for some time on their own pantry stocks of nonperishable foods, these stocks being fairly large at present.

Reconversion and Prices

There are no reconversion problems of any great moment for the food industry. Food is pretty much the same in peace as in war. It may be packaged or preserved slightly differently. Nevertheless, reconversion of other manufacturing industries affects the food industry in two ways: population shifts, and prices that people will be able to pay. In the interval between V-E and V-J Days, there is a prospect of slightly lowered food prices, probably because of the temporary unemployment that is anticipated as the automatic cut-backs go into effect and because of reduced military food demand. A further possible factor is the size of government stockpiles, both United States and Allied, which some commentators aver is unmanageably large. While I admit that they probably are large (they ought to be), I cannot yet agree that they are big enough to be a postwar business threat. There are too many places abroad where food is needed to warrant such fears. And the war is still far from won.

Much more important in possible effect on the price situation are: world food supplies, crop production in 1945 (which is affected by the government's plans and by weather), the increased mechanization of agriculture, and the size of pantry stocks and government owned stocks. By the most pessimistic view, the latter are large enough to feed about 20,000,000 persons for a year. But according to the worst of the aforesaid pessimists, more than half of this amount is owned by the British Ministry of Food. It probably will stay in Britain or go to Continental Europe. Until Japan folds up, I cannot get excited about present government-owned food stocks.

OPA officials expect a decline in food prices from natural causes as opposed to governmentally arranged causes, in mid-1945. If the prices go as low as expected, they will reach 1942 figures. Anl if they remain there for from four to six months, the OPA will remove the price ceilings. The hope has been expressed that the price decline will take place in the first quarter.

High Production a Factor

World food production (not stocks or reserves) was up 7 percent in 1943 over 1942, according to a 30-country survey recently released by the U. S. Department of Agriculture. The figures are averages and capable of all the misinterpretations that can apply to averages. But North American production of food

was up 30 percent, South American production was up 17 percent, while western Europe, North Africa and the Middle East were down by a percentage that would average out at 7 percent for the 30 countries surveyed. These countries comprise 60 percent of the world's population.

Droughts Will Come

The continued phenomenally high rate of U. S. farm food production can be explained by good growing weather, increased use of commercial fertilizers, increased use of hybrid seed, and previous long-time soil conservation measures. We have hit the jackpot on growing weather for about eight years in a row. This cannot keep up forever. Sooner or later, we shall see a repetition of the droughts of 1934 and 1936, or else the law of probability must be forever discarded.

Soil fertility is stated by Washington officials to be showing signs of deteriorating despite the high rate of fertilizer application, and the idea is growing that 30,000,000 to 40,000,000 acres will need to be withdrawn as soon as the war is over to return this land to soil conservation. This should be done promptly without waiting for a period of acute distress to force action. This probable future action, coupled with the shift of population from farm to town that has occurred during the war, will do much to offset burdensome agricultural surpluses.

The decline in farm population has received very little of the attention it deserves. Hired farm labor now numbers about 9,670,000. This is a decline of about 1,000,000 in the face of a total population increase in the United States of nearly 6,000,000 since the 1940 census. Some say the decline is as much as 2,000,000. Despite the decline, the production of agriculture not only has been maintained, but has been increased roughly 30 percent since 1939. Mechanization has made this possible, plus the higher yielding hybrid crops and greater fertility of soil. Some students of the problem state that the lost agricultural workers cannot, or will not, ever be taken back by the farms. All this trends toward prosperity for agriculture, especially if the size of the agricultural plant is reduced after the war by 30 to 40 million acres for the purpose of soil conservation.

The great unknown in the food processor's future is the matter of the size of the pantry stocks in the homes of the people of America. A study by A. C. Neilsen indicates that the amount of food in the American pantry is surprisingly large. Unfortunately, however, there are no comparable prewar figures with which to make sound comparisons.

How Much Take-Home Pay?

Even if all the millions of displaced workers get new jobs and a substantial change to civilian peace economy is put into effect between the collapse of Germany and the fall of Japan, there is another vast problem of what wage rates and hours of work will be. These will determine the price levels for the food manufacturer, as well as have tremendous effects throughout the whole economy of the nation.

With a partial return to peacetime hours of labor, the take-home wages of war-plant workers will be reduced to about 60 percent of wartime take home just because the overtime will be cut off. This calculation assumes, of course, that wage rates will not be reduced. If the hourly rates are reduced, the decline of take-home wages will be still worse. This matter of take-home is the real basis for expected prosperity (and the only basis of being able to cope with our national debt when the war is over).

It is unlikely that wage rates will be reduced. On the contrary, it appears likely that organized labor will see to it that wage rates are increased. Labor sees take-home wages as the real market for the products of Labor's effort, and is planning to insure big markets in this manner. If Labor avoids restriction of output, it is possible to accomplish their desired end. But the process of its attainment is likely to be very painful, and the future appears to hold the threat of more strikes than have ever been seen before.

Labor economists and government economists—nay, even some business men who are temporarily in Washington—are convinced that high take-home wages and big mass markets are synonymous. You can't have one without the other, any way you look at it.

The period of strikes can be of long or short duration, depending on two factors: (*a*) Whether business management can be persuaded that the high wage-big mass market idea is sound enough to give it a good try. (*b*) Whether labor—leaders and rank and file—can realize soon enough that the art of mass-persuading the public to buy is a function of management, not of labor, and that no strike ever persuaded people to buy any product.

Whether or not profits will result to industry under the foregoing general idea will depend on the government's income-tax policy. If present corporate income-tax rates continue in effect, we can look forward to a period of profitless prosperity like the "Twenties."

Confusing Regulations

Major headaches for the food manufacturers in 1945 will arise from the confusion of regulations, most of which have their origin in matters political. Congress has declared that many products of agriculture must be supported by government buying to maintain prices, that OPA may not impose ceiling prices below certain parity ratios, that OPA must not allow prices to go up, that WFA must hold certain minimum price floors. With all these mutually contradictory laws and regulations, the manufacturer who uses agricultural raw materials must contend. And unless the new Congress shows more independence and common sense than the expiring one, the future will be one that will make the oblivion of the grave a much desired condition.

Filling the Pipe Lines

If V-E day comes during 1945, the great effort of all industry will be to fill up the depleted channels of trade with their customary stocks. This will include food manufacturers as well. Filling the pipe line must be watched with care and correct deductions drawn from this phenomenon. In years gone by, many a food manufacturer has been badly fooled by the changes in

the volume of sales from the factory. The best advice to take after V-E Day is to keep one eye on the pipe line at all times. If any one manufacturer's sales show marked deviation from the trend of other manufacturers' sales, it may have some significance. But if all enjoy huge volume or sudden slow-downs of factory sales it will probably mean only changes in the fill of the pipe line.

Political Factors to Ponder

Before leaving the general and nation-wide factors affecting the future of the food processing industry, the political factors must be mentioned, though not explored. These include such matters as support prices versus common sense, *e.g.*, eggs. If the WFA buys enough eggs to support the price as directed by Congress for political reasons, there will not be enough warehouses in the country to hold the eggs. Then there is the political problem involved in cane versus beet sugar, the outcome of which is beyond the scope of this commentary. It would seem, however, that it would be far cheaper for our whole economy to do all one or all the other—prohibit the importation of any sugar at all, or else buy up all the beet sugar farms and refiners, all the domestic cane sugar lands and then remove all tariffs on sugar. Another little political matter is OPA price ceilings on dressed meats without a ceiling on live animals. Your guess as to when common sense will be restored to the nation is probably far better than mine, for I do not expect to live long enough to see it.

And finally, there is the very important political matter of foreign trade, which must depend on imports from abroad if it is to last beyond the immediate postwar period. Many other nations need the products of America but cannot buy them in quantity unless we will acept their products in exchange. The matter is controlled by tariff policies—strictly political.

Food Plant Expansion Needed

In estimating the prospects for the food processing industry it is always important to keep in mind the principle that per capita consumption in the United States is not notably variable. It comes as close to being a fixed quantity as anything in our economy.

Changes that will take place after V-E Day are not likely to be very apparent before the German collapse, except in the nature of plans for the future. The current demand for both light and heavy ammunition for bombs, large aircraft and trucks will insure continuation of WPB restrictions on purchases of factory equipment before the controls are really eased off.

But as soon as V-E Day comes there will be plenty of civilian activity. And still more after V-J Day.

The population of the United States, including men and women overseas, is calculated by the Census Bureau to be 138,100,874 as of July 1, 1944. Our food processing establishments, with the exception of vegetable dehydration plants, have been pretty much retained at 1941 levels, yet there has been a population increase of roughly 4,000,000 since then. This insures a certain need for expansion of plants, especially for baby foods.

$600 Million for Deferred Equipment

Furthermore, there are nearly three years of deferred maintenance and replacements to existing plants which will touch off a prodigious volume of purchases when the Germans cry "quit." Some corporations have long-range plans for completely revamping their plants. One has named it a "Three-Year Plan" in the belief that it will be rebuilding and modernizing its whole establishment for the three years beginning with V-E Day. The pent-up demand for equipment in the food-processing industry is proportionately as large as in any other industry. And food processing is the biggest peacetime industry in the land, exceeded only by aircraft manufacture in wartime.

My guess is that the industry will be in the market for $600,000,000 worth of deferred purchases during the coming three years.

In addition to the deferred purchases, there are many changes ahead based on technological changes in methods of food preservation. Or to phrase it more accurately, changes of preference in methods of food preservation.

Future for Dehydration

Dehydration, particularly as applied to vegetables ordered by the Army, has proved to be a successful wartime emergency method of food preservation when carried out by some of the methods now in existence. Its future in peacetime, however, does not hold the promise that many had hoped for it when the products were first demanded by the armed forces. Until the dehydrated vegetable is cheaper, of better quality and more convenient than the raw form, the public is not likely to buy it in a big way—certainly not enough to support the greatly expanded industry that now exists. Since there still are several methods of commercial dehydration of vegetables that have not been widely exploited, yet hold promise for the future, it is too soon to write off dehydration as a method of food preservation in peacetime. We can look for announcements of improved methods in the coming year.

Freezing and Canning Outlook

A far different picture for the future of quick freezing is the outlook for 1945 and thereafter. This method of preservation, with an experience that dates back to about 1928, is due for a big increase as soon as WPB relaxes on materials and sufficient manpower is available to fabricate the equipment. Many dehydrators are planning to convert their plants to freezing plants, and many canners are planning to add the freezing operation.

Canning as a method of preserving foods will continue to enjoy its present popularity. V-E Day will ease the metal-container situation. And if current experiments with a new method of producing high-grade tin concentrates from low-grade tin ore prove successful the tin scarcity problem will be relieved long before Malaya resumes exportation of its high grade metal.

L. V. Burton EDITOR

The Talk of the Industry

• Good postwar projects completed—Spencer Kellogg and Sons, Inc., has announced in a letter to stockholders that its research laboratories have completed a practical and effective method to give soybean oil all the desirable drying qualities of linseed oil.

• Poultry shortage will grow worse, New York's Little Flower declares. Anyone who has to eat six to eight luncheons and banquets a week where the choice is always between fried chicken and fried chicken—and usually very poorly prepared even in the best of hotels—will not find the shortage irksome.

• Every so often we get a distinctly localized pain when some manufacturer refers us to the CED (Committee for Economic Development) when inquiries are made as to that firm's procedure in postwar preparation. The only possible conclusion is that such a firm has not yet discovered that it has a job to do. That job, in case it interests you, is to make preparations for putting more people to work when war's demands are satiated.

• We sympathize with anyone trying to exist under price ceilings in the face of advancing costs. But the plea of Pan-American Coffee Bureau, that the neglect and abandonment of coffee trees by millions and millions in Latin America may result from operations at a loss, suggests that somebody has a short memory. Back in the middle 'Twenties, the planting of coffee trees in Latin America, augmented by unwise government policies, brought into bearing so many millions of additional trees that in the 'Thirties of unhappy memory coffee was burned and dumped in the ocean. Are these extra trees the ones that are to be neglected, or were they cut down long ago?

• All the great agitation in early Autumn to get industry ready to reconvert rapidly to peacetime production has been followed by a reversal of policy. More men have been called into military service. Aluminum has been returned to the list of critical materials. Truck-tire manufacturers have been put on a 7-day week. And so on.

It is suggestive of a maxim of the French Army in the first World War: "When you receive an order, do not obey, but wait for the counter-order."

• Results of the study of feeding vitamins to Duke University students at the request of the Quartermaster General of the Army have been published in the *Journal of American Medical Association*. The study proved exactly nothing, in the sense that control groups had just as much energy and sense of well-being as the treated groups. Normal healthy young men with demonstrated normal vitamin requirements, eating a normal diet, apparently got enough vitamins from their daily food to preclude any benefit from additional vitamins. As could be expected, the report has started quite a fuss and discussion, to which we add our two-bit's worth: Not all people are healthy normal young men who are known to be free from unusual vitamin requirements and fed on a normal, carefully supervised diet. So what?

• It begins to look as if Professor Harry Steenbock of the University of Wisconsin would have done just as well for his conscience and the welfare of humanity if he had sold his irradiation patent outright to the first bidder (the figure of $1,000,000 arises from the dim past) as to assign it to the Wisconsin Alumni Research Foundation. The United States Department of Justice has filed an amended counter-claim as an intervening defendant in a private case—the Foundation *vs.* Douglas Laboratories, and has named all the 16 licensees of the Steenbock patent. Says the Department of Justice:

"The government charges that the foundation is still attempting to enforce the patents involved, and the licenses based on them, despite the fact that the patents are invalid."

Hors d'Oeuvres

• *Definition—A consultant is a man who knows less about your business than you do, and gets paid more for telling you how to run it than you could possibly make out of it, even if you ran it right instead of the way he told you.—Anyway, it sounds good enough to be true.*

• The bread of France is not baked in the home. It is the product of the *boulanger,* who is a local character akin to our iceman of the pre-Frigidaire era, and like him is associated in cartoons with lonesome cooks and discontented housewives.

• *Only one of every five men and women eat a nourishing breakfast, says WFA. Maybe the breakfast food manufacturers ought to do less advertising to the kiddies and more to adults. It would at least take a lot of tripe off the airwaves.*

• Ersatz garlic made from foul smelling asafetida is a new product which received dishonorable mention at the annual meeting of the American Public Health Association.

• *Chicken feathers have come to the rescue as substitutes for prewar pipe cleaners. We've tried 'em, and they're really nothing to crow about.*

• Britain's Imperial Chemical Industries, Ltd., has developed a new synthetic wool fiber from peanut protein, from which they will make clothing that is literally the nuts.

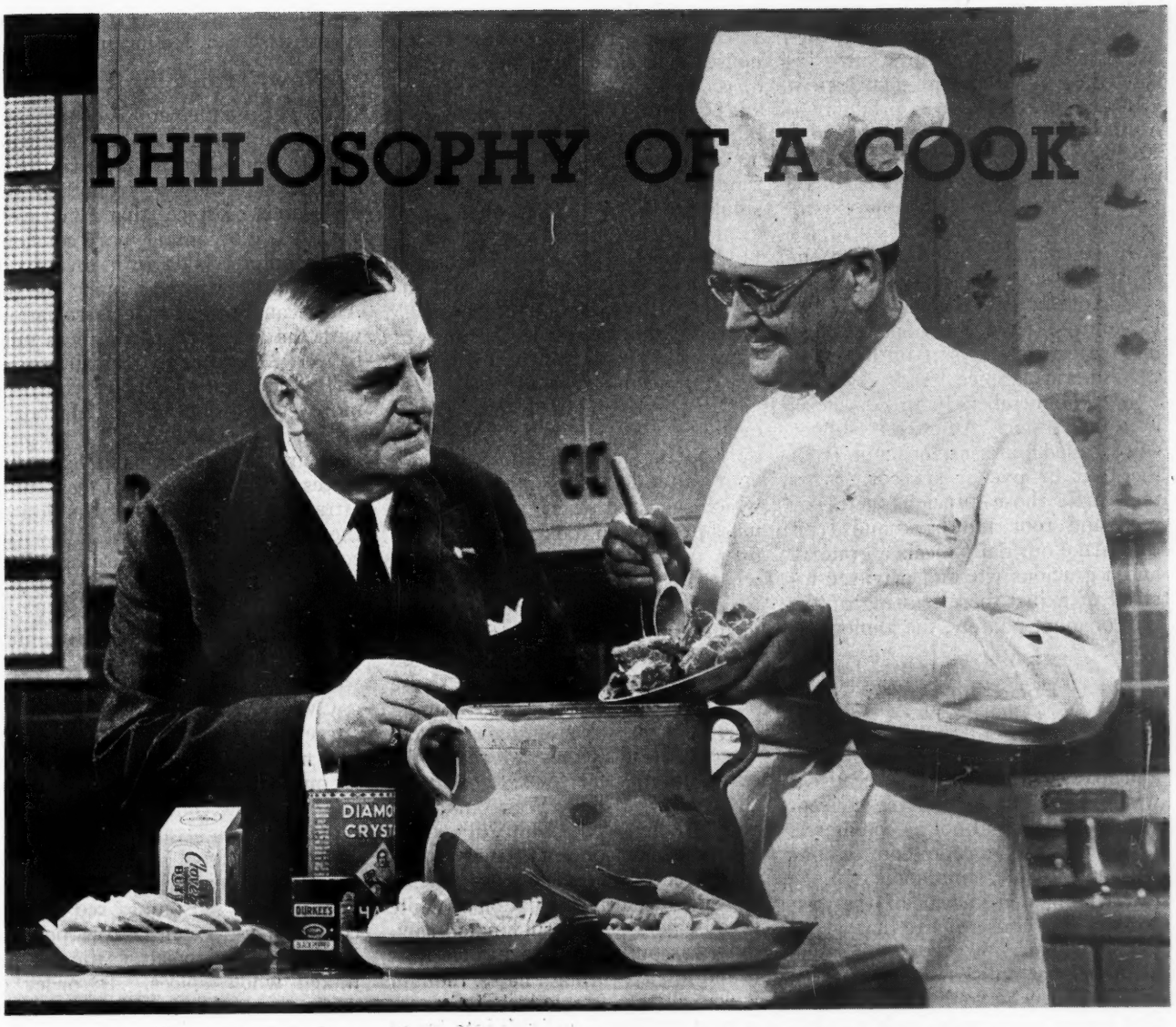
• *Permit us to quote a bit of home spun philosophy from "The Scotsman:" "We are not suggesting that there is any formal resemblance between Macbeth and a dehydrated potato, except that dehydration associated with a potato suggests a note of classic dignity, of austere severity." You figure it out.*

• An automatic sandwich machine developed by employees of Brooklyn Tech High School will turn out 3,500 sandwiches an hour. And it really puts some filling in them.

• *As long as 2,000 years ago, Spanish glamour girls used yeast skimmed from beer vats as a skin beautifier to make them more intoxicating.*

• Researchers report that the cotton rat suffers tooth decay on a synthetic ration high in sucrose and almost no decay when dextrin replaces sucrose in the ration. If men are mice bicuspidally, such findings may raise cain with cane sugar. *F. K. L.*

PHILOSOPHY OF A COOK



The author (right) gets a few pointers on the art of preparing food from Oscar of the Waldorf.

Every food processor and technologist ought to have at least a little of the "religion" espoused here by a high priest of cuisine. Certainly you will profit from the inspiring, if pointed, remarks about the need for more flavor in food*

By CROSBY GAIGE, New York, N. Y.

MASS production of food has seldom brought forth products that satisfied the soul as well as the body. We can, and do, eat these manufactured foods. We can, and must, get from them the necessary proteins and carbohydrates. But Gaster, God of the Belly, often sulks in his tent and well knows that he is getting short change in the brief span of life that is allotted to him.

That undoubtedly is too wide a generalization and is subject to all of the infirmities of ex-cathedra pronouncements. There are many food manufacturers who started humbly with a sound if humble idea and have employed their increasing prosperity to maintain the integrity of the original concept. *The present function of a food chemist, or technologist, in the employ of such companies is to preserve these original creative integrities under the ever increasing problems of supply and demand.*

What I am trying to say, and I am sure that most of you will agree with me, is that the practice of competition—not as to quality, but as to price—is a vicious circle that defeats itself. The urge to please, to placate, to feed the great gaping, unconscionable, all-devouring maw of an uncritical and unintelligent public—through cutting a cent a gross here or a dozen there—ultimately will ruin and destroy anything of savor or sapidity that our basic food once had.

Let us forget cheapness in price as applied to food. After all, it's the most important thing we buy. We do not mind paying a premium for

*From an address delivered before the American Chemical Society, Sept. 12, 1944, in the Symposium on Flavor.

high-octane gas. Why not assume the same attitude toward "high-octane" food. Food manufacturers—and you gentlemen who guard, protect and preserve their products—have, it would seem to me, the duty and privilege of *leading* public taste, of setting norms and standards on a much higher level than now exists, instead of entering into squabbles over fractions of pennies in chain stores and supermarkets.

For more years than I would like to count, I have functioned as the high priest, or advisor, on flavor to the American Spice Trade Association. The members of this Association have, since American Clipper ships sailed the seas, brought from the four or five or six corners of the earth those precious gifts of seed and root and bark and fruit that make our daily meals a grateful and a gracious rite and privilege instead of a just mere stuffing of the gut, or more politely, the alimentary canal.

Food as Art

If, in this discussion, I seem to digress and to wander in strange and divergent paths, it is because I wish to present to you the concept of food as art and not as commerce. If art is the cornerstone of our national cuisine, commerce will be the handmaiden instead of the mistress in this house of life that we all too briefly occupy. I can imagine no finer accomplishment for a food chemist or technologist than to make this tenancy not only healthful but pleasant.

The food we eat goes into the mouth and ultimately, we hope, goes out some other place. We may and do get the sustenance for our bodies from this process. We may, by and with the aid of certain pills and milks and salts, be able to eliminate the rather dreadful detritus. Do we get pleasure, fun, relaxation? My answer would be an emphatic NO! We get colitis and ulcers of the stomach. Our national distemper might well be called *Colitis Americanus*. Why is this possible in a land of plenty, a land of milk and honey, a land, normally, of surpluses of practically everything except caviar and truffles? Well, I will tell you that in my humble opinion the answer lies in our American preoccupation with the fetish of mass production.

Now mass production is something that applies itself perfectly to iron and coal and oil and ships and machines, but less perfectly to food and to houses. Have you ever looked at one of these government-sponsored housing projects where all the houses look alike, have the same tilt of roof and the same porch, chimney and coloration, like so many ant hills? People who live in such monotony must ultimately get to resemble the termites who build in similar pattern. This analogy is even more important as applied to food, for food is the timber from which our bodies are built and the body is the habitation of the soul, the mind and the spirit that urges us "upward and onward" to better and more satisfying levels of life.

Perhaps I might briefly put a period to this part of my argument by drawing politely, but firmly, to your attention the mass murder which occurred when commerce and mass production took final authority over our daily bread. The stone wheels in the old gristmills ceased to turn, the mill race and the mill itself disintegrated, the stream flowed unheeded over the ruined dam with no purpose whatever except to pause now and then to form a swimming hole under a spreading elm or sycamore, and ultimately to reach the sea. Flour went West, perhaps I should say Middle West, in a big way. Flour became white, lily white. Bread lost not only its flavor but its sustenance. Nevertheless, we American suckers became a nation of white bread-eaters. This sublimated sawdust was put before us and we took it and finally, through habit, thought it was all that it should be. Science is now trying to put back into bread by synthesis what mass production took out of it.

Let us, for the sake of illustrating my point, use the word trade instead of manufacture or commerce. Trade, according to the dictionary, can mean anything practiced for a livelihood; or it can mean a skilled handicraft, an art. And so, in dealing with flavor, you would be wise to forget the price of pepper and concentrate your attention upon what a peppercorn can do. Do not evaluate mace or cloves, or the humble mustard seed in terms of pounds and pence, in terms of carloads and barrels and bales, but in terms of the minute taste buds in every human mouth, in the terms of those obscure sensory nerves in every human nostril. These unseen, indeterminable gods of the palate, these so-called organs of taste and smell, dwelling in warmth and in darkness, rule our lives, our stomachs, our digestion, our assimilation. They still function, pleasantly and successfully, when the so-called and much overrated sexual system is but a fleeting memory.

New Trend in Flavor

To you gentlemen who are concerned with food chemistry and control, I would like to say that there is a new wind blowing from those far off islands of spice; that Americans are rapidly becoming more consious of seasoning and flavor in their food. A recent survey was made by the American Spice Trade Association, with the aid of 88 newspapers published in 84 cities in 28 states.

To the question, "Have you used more spices since Pearl Harbor?" 18 per cent replied "Yes." They gave as their reasons for this increase that spices made cheap cuts of meat more attractive; that rationing has limited them in the use of their favorite recipes and that they use spices to make economical dishes more appetizing; and lastly, that they are using more spices in preparing lunch boxes for members of their families working in war plants.

Over 50 spices were listed in the survey, and it was refreshing to see how many spices not generally popular on a national scale just a few years ago have now come into general acceptance. For example, the survey showed a national rise in the regular use of such seasonings as chili powder, poultry seasoning, red pepper, celery salt, cayenne, curry powder, celery seed, onion salt, garlic salt and mixed whole spices. In order of preference, the families' favorites are: cinnamon, nutmeg, paprika, cloves, allspice and ginger. The appearance of paprika and allspice on this list will come as a surprise to many—especially in the order in which they were given. Pepper was not even mentioned, because like salt, it is on every table and is looked upon as a necessity and not a seasoning.

It will provide both pleasure and profit to those who deal with flavor to cultivate the acquaintance of the old-fashioned culinary herbs that gave zest to the food of Europe before spices came by sea and by caravan into Venice, from the East where they had their natural habitat. They were called pot herbs because they belonged to the kitchen rather than to the pharmacy. I have grown most of them in my garden and greenhouse, and they are a constant source of grace and nuance in the meals that are served at my table. There are a score or more of these flavorsome plants that deserve study by any food chemist or technologist who has an appreciation of the poet-

ry of the palate as well as an understanding of the prose of proteins.

There are the thymes, the marjorams, the savories, rosemary, fennel, the mints, sage, burnet, borage, the parsley family; chives, tarragon, garlic, some of the artemisias, *calendula officinalis*, and many members of the vast allium clan that is perhaps nature's greatest gift to the kitchen. I have grown over a hundred varieties of onions, and each one served a purpose.

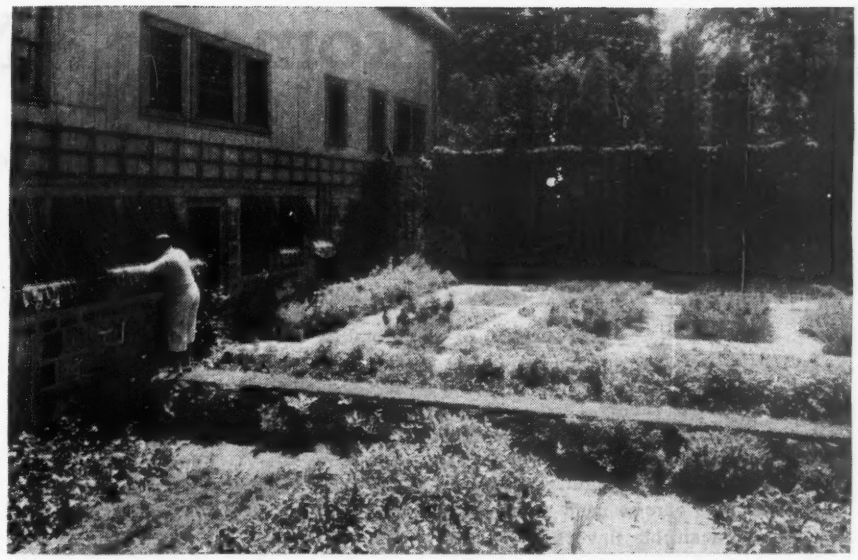
It has been our habit to import most of our herbs, mainly from the Adriatic Coast and Mediterranean basin. From a long-range point of view, I do not think it was good practice to import those herbs that we can grow ourselves, because crude methods of harvesting and drying, long storage and the voyage at sea were responsible for the loss of much of the original flavor. We will have to deal with imports for some time to come. Today, herb gardening, both private and commercial, is springing up all over these states of ours.

It is my notion that we should make herb growing an American business and pastime; a source of real *difference* and variety in the chromatic scale of flavor; that we should dehydrate our herbs properly by scientific methods instead of wasting their fragrance like so much hay withering under a blistering sun; that we should store them in tight containers to conserve their precious essences. By doing so we will not only make our food more interesting and savory to ourselves, but more pleasing to the international palate.

How To Learn Flavors

How does one learn this highly elusive, highly empirical art of seasoning, of flavor, of pleasing the palates of mankind? The answer is simple—*by trial and by error, by having an infinite curiosity about food and an infinite patience in dealing with its potentialities.*

Just to stress this point—which seems to contain the nut, or kernel, or pith of this thesis—I would like to ask, and not to intrusively, how many, as an escape from stereotyped procedure, have ever adventured with cassareep, the inspissated juice of the cassava, in flavoring stews or ragouts? How many are familiar with Nepal pepper, from the slopes of the Himalayas, a condiment which seems, in some strange way, to be companionate with certain bivalves, particularly the clam? Who has more than a passing acquaintance



Many types of herbs are grown by the author in his own garden as part of his palate pioneering.

with chervil or saffron, or the *Allium ascolonicum*, which does little jobs of flavoring for the French *chef de cuisine* in a manner that can be performed by no other onion? Who knows, or cares, that oregane, a useful and pungent herb loved by Latin American palates, an ingredient of chili powder, was misnamed by the Spaniards perhaps four hundred years ago? It is not a member of the origanum or marjoram family. Botanically, it is *Coleus amboinica*, and vulgar folks in the Philippines call it *suganda*. As a just observer of the ought and must of other people's preference as well as my own, I keep in the cabinet that contains my spices and seasonings a jar of dried shrimp. They add the grace-note, the final touch to many dishes loved by those fine cooks and competent allies of ours—the Chinese.

A few weeks ago I made a brief gastronomic visit to Mexico. The fare in their more fashionable hotels and night clubs would warrant a wise eater in founding "The Worst Meal of the Month Club." Their native cuisine, however, based upon Indian, Creole and Mestizo tradition, is one of the most interesting and most savory that I have ever enjoyed. The use of their chili peppers runs through their cooking like the reds in a Turner sunset, but it would be completely erroneous to assume that most of their dishes would scorch our provincial palates. As an amateur in the art of seasoning, I have been promised the seeds of forty-odd varieties of chilis and capsicums ranging from the torrid to the temperate. I purpose to plant them in my garden, to grow them to experiment with them in my kitchen, to learn, if possible, their different tones and qualities and uses.

A study of native Mexican food would be a liberal education to any food chemist or technologist whose life and work had been circumscribed by the laboratory and its immense and varied impedimenta, whose sense of taste had been obscured by preoccupation with the centrifuge.

We are all apt to take ourselves and our science a little too seriously. We may, indeed, become foggily complacent with the notion that we invented science and civilization and a lot of other things. As a matter of fact, Mexico had a university and a printing press about a hundred years before John Harvard was even a gleam in his father's eye. American chemical research has of late been dealing with the enormous latent source of vitamins that lie hidden in alfalfa, in other grasses, in the members of the mallow family. South of the border, down Mexico way, Indian women, with wide basic wisdom, have for centries made use of this same greenage when they were with child or nursing one.

We Are Too Smug

We natives of these Estados Unidos del Norte are much too smug and unimaginative in our approach to food. Those of us who stem, as I do, from early Puritan stock, have perhaps the worst of all gastronomic traditions to live down. The Puritans, those voyagers on the "Mayflower" and subsequent barques, did not believe that anything in life was good

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The "Stinkometer"—New Tool

How it can be used to measure spoilage by quantitatively evaluating gains in odor and to determine deterioration by evaluating loss of odor. Has wide possibilities

By O. W. LANG, L. FARBER and F. YERMAN,
University of California, Hooper Foundation, San Francisco, Calif.

The "Stinkometer" develops a new and reliable means of evaluating freshness in foods by measuring volatile odors. It also can be used to measure the loss of desirable flavors.

The method apparently is applicable to meats, prunes and raisins, as well as fish, in the first instance and to coffee, spices and perfumes in the second. —THE EDITORS.

TESTS for judging the edibility of fish and other foods intended for human consumption have depended, in the past, largely upon determining their degree of freshness by organoleptic opinions. The validity of such tests used in connection with marine products is based on the generally accepted fact that freshly caught fish possess relatively little odor, and that with progressive onset of spoilage, foreign and unpleasant odors are produced. Because of the diversity of bacterial products found during spoilage, and of the lack of a general chemical procedure to determine such decomposition, fish inspectors have depended largely upon their sense of smell to detect initial signs of spoilage.

Certain adverse factors inherent in the test, however, have affected its efficiency, especially in making decisions in cases of "borderline" freshness. For in addition to the subjective and only roughly quantitative nature of the organoleptic test, there are other complicating factors such as the influence of temperature on the volatility of odorous substances, the masking of odors, personal opinion and bias, the odor sensitivity of different people and olfactory fatigue.

The authors have found that bacterial flora encountered in fish flesh during initial and progressive stages of decomposition vary greatly with specific spoilage instances. No single type of bacterial flora can be invariably associated with all kinds of

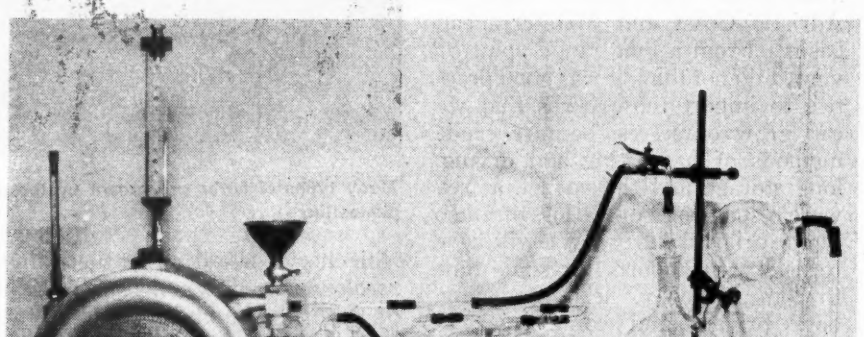


FIG. 1. Arrangement of apparatus using an air meter. A, aeration flask; T-1, T-2, reaction vessels; M, West-test air meter; W-1, concentrated H_2SO_4; W-2, W-4, redistilled water; W-3, 10 percent alkaline potassium permanganate or activated carbon.

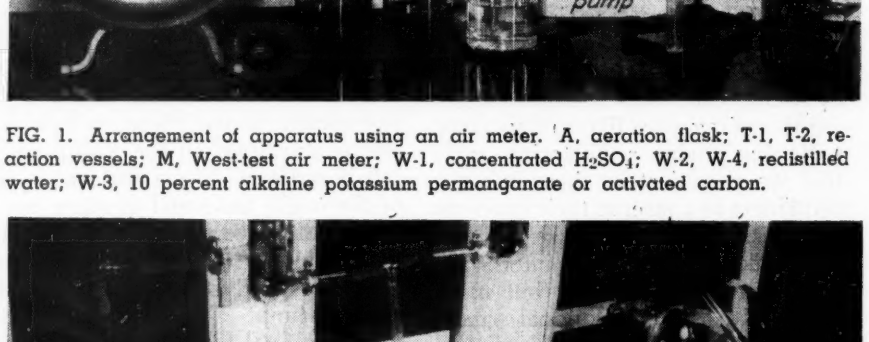
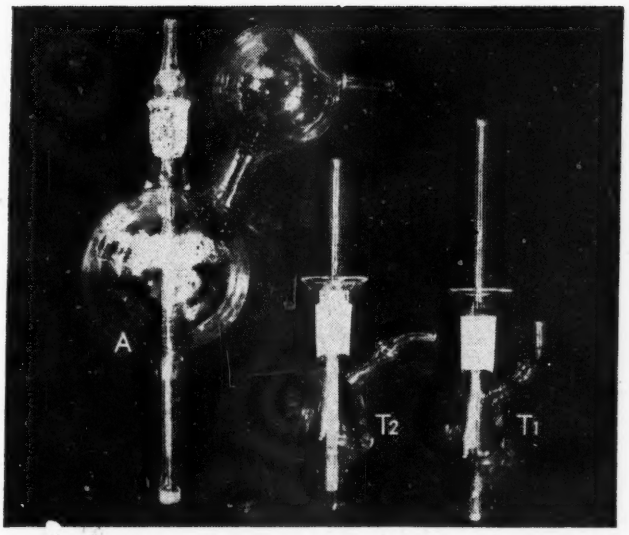


FIG. 2. Two-unit portable arrangement of apparatus. A, aeration flask; F, flow meter; T-1, T-2, reaction vessels; W-1, concentrated H_2SO_4; W-2, W-4, redistilled water; W-3, 10 percent alkaline potassium permanganate or activated carbon.



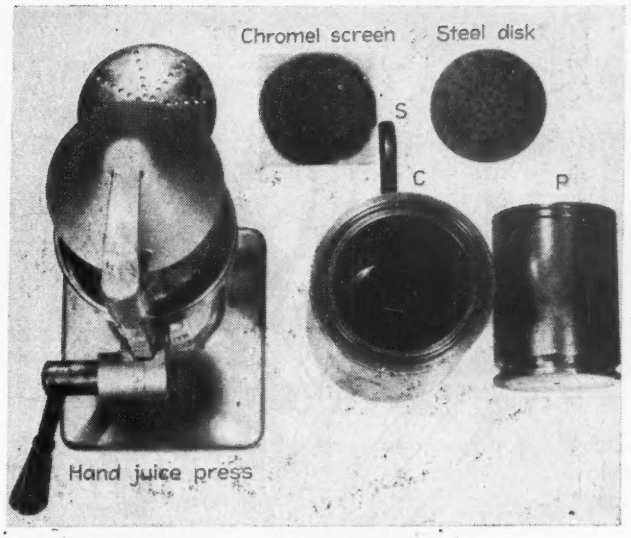


FIG. 3 (left). Aeration flask (A) and reaction vessels (T-1 and T-2) with air-inlet tubes.

FIG. 4. (right). A hand juice-press (shown at the left of the picture) is used to obtain press-juice from canned fish. A laboratory press is used to obtain press-juice from raw fish, and the parts used, shown above (right), are arranged in this order: steel disk (upper right), chromel screen (upper center), felt pad and second chromel screen, the sample of ground, raw fish wrapped in cheese-cloth, and the piston (right). These parts are inserted in the laboratory press and are subjected to a pressure of 3 to 5 tons.

decomposing fish. In general, proteolytic forms of spoilage may predominate at temperatures of about 80 deg. F. (26.6 deg. C.). But at temperatures between 60 and 70 deg. (15.5 to 21.1 deg. C.), incipient or initial stages of spoilage often are associated with saccharolytic forms. And at low temperatures, ranging from 25 to 45 deg. F. (-4 to 7.2 deg. C.) lipolytic forms more frequently are encountered. Volatile odors emanating from fish flesh during these stages of spoilage vary in degree of strength. In fact, at some stages, spoilage odors can be entirely different from those usually associated with fish and are so light and delicate that only the "educated nose" of a trained and experienced inspector can possibly discern them.

A number of chemical methods have been proposed for evaluating the acceptability of foods for human consumption. The basis of most of these methods is the determination of certain specific substances, or groups of related substances, such as indole, H_2S, volatile nitrogenous bases and volatile acids. All of these have a very definite place in the scheme of spoilage detection, provided that positive tests for definite quantities can be obtained in the sample under observation.

Thus, in the use of any specific chemical test, established practices presuppose that the spoilage product sought has been produced in preponderance to all others. But bacteriological findings do not substantiate such an assumption. In fact, fish may be spoiled and yet not yield a positive test for the substance upon which a particular chemical reaction depends, because the compound sought has not been produced during the course of spoilage.

Even in view of these limitations, the evaluation of good and objectionable odors offers the best basis for a reliable quantitative method—if the subjective and personal factors can be reduced to a minimum, or entirely eliminated. To develop a chemical procedure, in which the volatile substances responsible for odors could thus be determined, the authors found it necessary to investigate the various types of microorganisms present, as well as their metabolic activities, to serve as a background for the study of incipient and progressive spoilage in foods. Consideration was also given to conditions favorable and unfavorable for the growth of microorganisms and to the predominant products formed under varying storage conditions.

Principle of the Method

The method is based on an aeration technic in which the volatile constituents responsible for odors are separated from the sample by a current of purified air, and subsequently passed into an oxidizing reagent. For the estimation of volatile odorous substances, an oxidizing reagent was adopted because the known odorous compounds belong to such groups as alcohols, aldehydes, ketones, acids, ethers and mercaptans, including hydrogen sulphide, and are oxidizable. The alkaline permanganate reagent was found more sensitive as an oxidant than acid permanganate, acid dichromate or ceric sulphate. The index of the concentration of volatile substances present in a sample is found in the amount of reduction of the oxidizing solution. This is determined by adding, successively, 5 ml. of 6 N sulphuric acid, 10.0 ml. of 0.11 N ferrous ammonium sulphate and titrating the excess of Mohr's salt with 0.01 N ceric sulphate in N sulphuric acid solution, using o-phenanthroline ferrous complex as an indicator. A reaction vessel containing 10.0 ml. of original alkaline $KMnO_2$ solution is used as the control, which is treated as described above for the aerated reagent. The difference between the test and control titers is proportional to the amount of reduction

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TABLE I—Increase in Volatile Substances in Raw Bluefin Tuna During Storage at 76 deg. F. (24.5 deg. C.).

Hours stored	Microequivalents reduction per 5 ml. in Loin	Belly	Organoleptic judgment of Loin portion	Belly portion
0.5	10.8	14.2	Normal odor	Normal odor
5.6	12.8	25.1	Normal odor	Normal to slight off odor
9.9	14.5	28.9	Normal odor	Normal to slight off odor
14.5	18.7	34.3	Normal odor	Slight stale odor
17.7	24.3	58.5	Borderline stale odor	Slight tainted odor
22.0	32.8	62.4	Definite tainted odor	Putrid odor

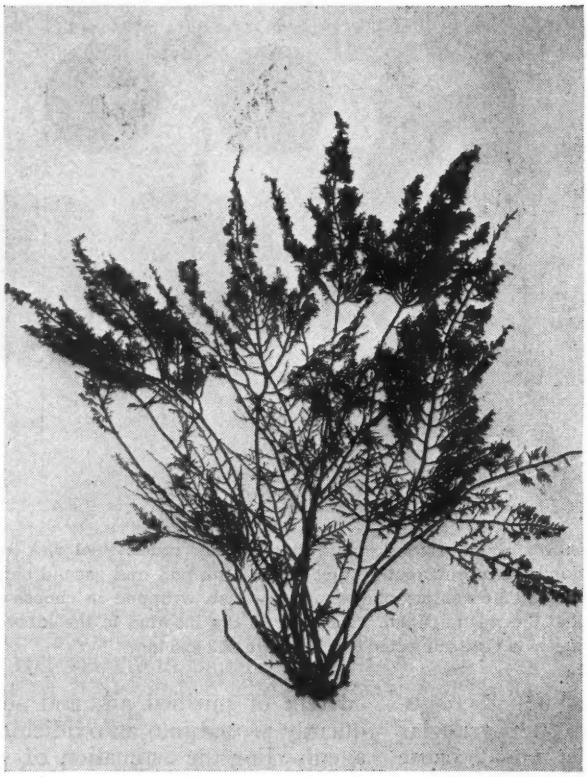


FIG. 1. Gelidium cartilagineum, the true "agarweed."

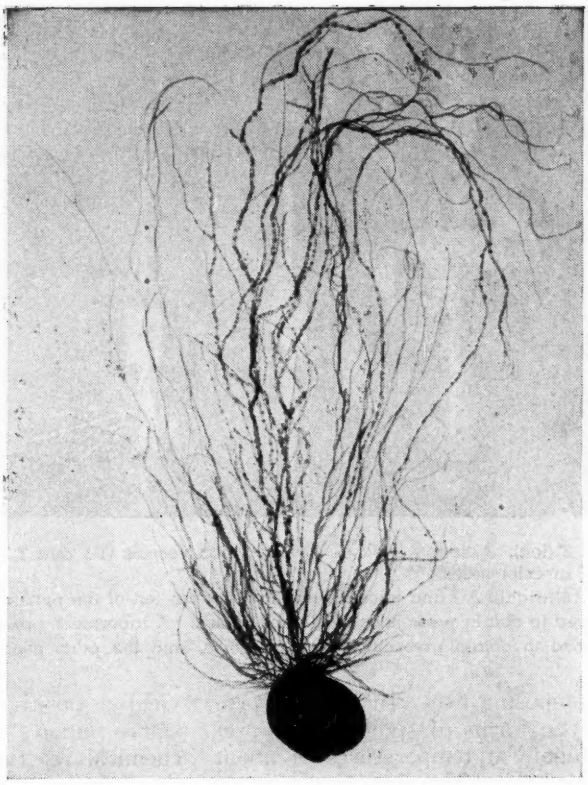


FIG. 2. Gracilaria confervoides, used for a time.

America's Agar Industry

PART I—Story of a raw material. It gives history and technology of agar and will leave you with a better understanding of product

By C. K. TSENG, Scripps Institute of Oceanography, La Jolla, Calif.

WHAT is agar? The U. S. Pharmacopoeia, ed. 12, 1942, defines it as "the dried mucilaginous substance extracted from *Gelidium corneum* (Hudsons) Lamouroux and other species of Gelidium (Fam. Gelidiaceae) and closely related algae (Class Rhodophyceae)." Similar definitions appear in various standard works, and, as a whole, seem indefinite, tending to include carrageenin and other red seaweed extracts.

The writer (Tseng, 1944*a*) has proposed a more precise definition: "the dried amorphous, gelatine-like, nonnitrogenous extract from Gelidium and other red algae, being the sulphuric acid ester of a linear galactan, insoluble in cold but soluble in hot water, a dilute neutral solution (1 to 2 percent) of which sets, upon cooling, to a firm gel solidifying at 35 to 50 deg. C., and melting at 90 to 100 deg. C."

Because of the lack of present knowledge concerning the chemical structures and physical properties of the various closely related hydrocolloids from red seaweed sources, any definition proposed now can only be tentative.

How is agar made? Agar is a very complex polysaccharide which occurs as a cell-wall constituent in agarphytes, such as *Gelidium, eucheuma* and *gracilaria.* Insoluble in cold but soluble in hot water, it easily can be extracted by boiling the seaweeds in water, congealing the solution by cooling, cutting the gel in whatever form wanted, freezing it by natural or artificial means, and finally thawing and drying it in the sun or by artificial heat. Freezing and subsequent thawing free the agar from salts and other water-soluble impurities originally present in the agar gel and produce a pure agar with rather low ash content.

For ages the sweetened and sometimes flavored agar gel has been used in China, Japan and the East Indies as a dessert. It was, however, in the middle of the seventeenth century, presumably in 1658, when the process of purifying and dehydrating agar in its present form was accidentally discovered by a Japanese innkeeper, Tarozaemon Minoya. He happened to note one morning that some agar jellies which he had thrown outdoors, and which had evidently frozen during the night, had thawed and dried in the sun to become translucent, membranous, porous flakes. Thus, the basic method of making agar utilizing natural freezing, thawing and drying was evolved. It still is being used by the majority of Japanese agar manufacturers.

The history of the American agar industry is that of the industry in California, for even to date, more than 80 percent of American agar is made in the southern part of this state.

A Japanese, Chokichi Matsuoka, established the first agar factory in the Western Hemisphere. In the early part of 1919, Matsuoka and six other Japanese formed the first American Agar Co. with a factory in Tropico (now Glendale), Calif., starting commercial production in 1920. Being familiar with modern American industry, Matsuoka improved traditional Japanese agar manufacturing methods by substituting artificial freezing for natural freezing. He also substituted chlorine bleaching for sun bleaching. Although less laborious, it is questionable whether chlorine bleaching produces as good an agar as the natural sun-bleaching process.

Matsuoka (1921, 1923) took out two American patents covering the method of agar manufacture. In his first patent, he emphasized the use of Gloiopeltis in his process and only casually mentioned Gelidium as a substitute.

Gloiopeltis furcata, the species he presumably used, does not grow in southern California, where he obtained his raw materials, and it is quite definite that he started making agar out of *Gelidium cartilagineum* gathered from the San Pedro Breakwater. While Gloiopeltis does produce a valuable hydrocolloid, it does not contain any appreciable amount of agar, and has never been used as an agar raw material.

The first American Agar Co. failed, probably because the Matsuoka process still involved the use of too much hand labor to be economically successful in this country. In 1923, the company was purchased by an organization headed by John Becker, a California engineer, who organized the second American Agar Co., and, in the next few years, modernized the manufacture of agar. Using some conventional equipment, Becker modified and invented a few new units. He took out four patents (1929 *a-d*) covering a special combined congealer and sizer, a dewaterer for flaked agar, a special dehydrater and also his entire process of agar manufacture. Today, the process used here is essentially Becker's.

Being a pioneer, Becker seemed more interested in devising new equipment, to modernize the American agar industry, than in actually producing agar, although he did make 162,686 lb. of agar in the first four years of operation (Table I). But the company was not strong enough to stand the strain of the last depression, and it finally closed in 1933. In the same year, a former employee of the company, S. F. Corfield,[1] established a small factory in National City, Calif., under the name, United States Agar Co. The agar produced by this and another small company in the years 1934-38 was reprocessed principally from Japanese agar, which was then so cheap[2] that it was no longer profitable to process agar in California, even with the relatively cheap Mexican Gelidium. The small United States Agar Co. eventually became the nucleus of the present American Agar and Chemical Co., now located in San Diego, the largest agar factory in the Western Hemisphere, with a production comparable to that of the larger agar factories in Japan. Most of the raw material for this factory comes from Mexico and the balance from Laguna, San Pedro and Redondo, in southern California.

TABLE I—U. S. Production of Agar and Imports from Japan.*

Year	U. S. production (pounds)	Year	U. S. production (pounds)	Imported from Japan (pounds)
1923	7,755	1934	1,802	.....
1924	7,281	1935	8,061	.....
1925	117,773	1936	data not available	.....
1926	29,877	1937	21,208	704,000
1927	.....	1938	7,170	589,000
1928	22,797	1939	8,098	497,000
1929	5,140	1940	24,000	635,000
1930	44,895	1941	52,000	597,472
1931	28,395	1942	110,054	.....
1932	10,009	1943	165,954	.....
1933	41,557	1944 (Jan.-Aug.)	113,762	.....

*Production output figures for 1923-1938 and first nine months of 1939 are from U. S. Tariff Commission report (1941). Production data from 1940 were supplied by present agar manufacturers. No records are available of Matsuoka's agar production from 1920-1923.

Industry of Today[3]

When the WPB agar freezing-order was issued (Feb., 1942), there was only one agar factory operating in the United States, with an output of approximately 4,000 lb. per month. In September, when the agar-freeze order was revoked, this company was producing some 12,000 lb. per month, and in the meantime three other smaller companies were formed, although one of them has never produced agar. One of these is Agar Products Co. (Los Angeles, Calif.), which formerly used crude imported Japanese agar. When this source was lost to them, they found it possible to obtain their raw material from nearby regions in the Pacific Ocean. This changeover occurred in 1942, and in November, 1943, the production output was 1,800 lb. per month. The Pacific Agar Co., Whittier, Calif., started agar production in June, 1943, and is now producing about 1,200 lb. a month. A small factory at Orange was active in agar production only for a short while, and probably produced no more than 2,000 or 3,000 lb. All in all, the total American Gelidium agar production during the period when agar was frozen by WPB amounted to about 364,770 lb., about 87 percent of which was produced in the San Diego factory.

The increasing demand for agar also stimulated the growth of this industry in Mexico, the source of most of the agarphyte supplies for California factories. Two new factories are reported as operating here, and the larger of the two has an estimated maximum monthly capacity of 4,000 lb.

Eastern scientists and industrialists also became interested in agar production because of the shortage. Investigations by Humm (1942) showed that another agarphyte, *Gracilaria confervoides*, is present in commercial quantities in the vicinity of Beaufort, N. C. While there is still some controversy as to whether this agar is as good as the Gelidium-agar for preparing general bacteriological culture media, there is no doubt that it will serve most, if not all, purposes in the food industries. According to Humm's recent re-

(*Turn to page* 192)

[1]Thanks are due to S. H. Corfield for supplying information regarding the history of the American agar industry and the present process.

[2]In 1933 the average price for imported Japanese agar was 49 cents per pound. However, during 1934 a large consignment of Japanese Kobe No. 1 agar sold for the low price of 40 cents per pound.

[3]Thanks to S. H. Corfield, L. K. Small and H. H. Selby of the American Agar and Chemical Co., E. S. Moorhead of Agar Products Co., M. E. Kirkwood of Pacific Agar Co., and American Chlorophyll, Inc., for figures on their respective production data and other pertinent information concerning the agar industry.

Sugar Shortage Reaches Acute Stage

Stocks at 10-year low. Food processors have curtailed production for lack of sweetener. Store shelves bare. Quick action by government needed

A Report by the Food Industry War Committee

SUGAR stocks of 465,000 tons in the United States on October 1, 1944, were at their lowest level in more than ten years. The United States in 1944 used some 750,000 tons more than was contemplated, so we will start off the new year with perhaps 500,000 tons lower stocks than at the beginning of 1944.

Many bakeries have reduced their volume of products requiring sugar or eliminated some such items. Soft drinks are less available than previously.

Candy purchases are being limited by many stores, some of which, lacking merchandise, only open a few days a week. Ice cream and other products requiring sugar in their manufacture also are in smaller supply.

The record low sugar stocks were caused chiefly by: (1) inadequate assignment of ships to bring in raw sugar that is available in the off-shore areas and (2) insufficient continental production of beet and cane sugar.

Other contributing causes have been the current conditions in Cuba, Puerto Rico and Hawaii, U. S. refiners' capacity and in the use of sugar for alcohol.

Refiners of cane sugar should have a steady and ample supply of raw sugar to operate refineries without interruption. Therefore, ocean shipping for the transport of sugar from off-shore areas, such as Cuba, Puerto Rico, and Hawaii, is the most important problem facing the government agencies involved in sugar control, with the exception perhaps of maximum encouragement for 1945 domestic sugar (beet and cane) crops.

Interested governmental agencies must bend every effort to see that all available ocean tonnage is used to the maximum extent.

Situation in Cuba, Puerto Rico, Hawaii

Cuba is now the world's largest producer of sugar. Prospects for a smaller Cuban sugar crop in 1945 than in 1944 were announced on Sept. 2, 1944, by the War Food Administration. This current Cuban sugar condition results from cutting old cane and the heavy harvesting of immature cane which, under normal conditions, would have been cut later. Crop estimates indicate 1945 Cuban sugar production will be 600,000 tons, or more than 10 percent, less than the 1944 crop.

Puerto Rican sugar production in 1944 was 423,000 tons, or 37 percent, below that of 1942. This crop decrease was caused, in part, by lack of sufficient fertilizer. A generally confused situation also caused growers to lose interest.

The principal problems of Hawaii are: labor, equipment needs, and fertilizer. We recommend that the government earnestly endeavor to ease the labor problem, give priority assistance on equipment, and provide shipping space *to* Hawaii for fertilizer and equipment.

The Domestic Picture

One of the major 1945 bottlenecks to any ample supply of refined sugar in the United States will be our domestic refining capacity.

Government assistance on manpower and necessary equipment priorities are needed. Ships should be provided in such a way that their steadily arriving raw sugar cargoes will allow full uninterrupted capacity operations of domestic refiners. This means a minimum — not an average—of approximately 500,000 tons of raw sugar imported each month, at least during the first nine months of 1945.

A possible, but necessary, result of such a program is refiners' stockpiling during the seasonally low consumer winter months, unless such demands as Army, Navy and Lend-Lease can be scheduled for the off-consumption fall season only.

Off-shore refining capacity should be utilized extensively during at least the first nine months of 1945, for direct shipment from Cuba to its final destination for at least a portion of Army, Lend-Lease and UNRRA requirements.

The three factors having the greatest effect on beet sugar production in the United States are as follows:

1. Time and method of announcement by the government of its plans and intentions regarding domestic sugar production.

2. Relationship between the established prospective price for beet crop and prices for competing crops.

3. Farm and factory manpower.

In the past, we have seen failure to consider completely these three points result in short crops.

The government took a constructive step this year by announcing at an early date its price-support program for the coming beet sugar crop. This action promises an increased acreage planting in 1945 (WFA is urging beet sugar producers to plant 951,000 acres instead of the 645,000 planted in 1944), provided that later on prices for other crops are not set on a basis that is competitively unfavorable to sugar beets.

Beet sugar normally supplies about 25 percent of our domestic requirements. During the past two years, our beet sugar production has been almost 40 percent less than in 1942, or more than 600,000 tons short.

Production of mainland cane sugar can be increased under war conditions only with government assistance in the way of financial support programs that would facilitate the obtaining of adequate labor by growers for the planting and harvesting of crops. The government has done this for the present crops. With favorable weather and continued government support, increased production is expected for the 1945-46 crops.

900,000 Tons for Alcohol

In 1944, about 900,000 tons of Cuban production was diverted from sugar to high-test molasses for industrial alcohol.

The United States had record crops of wheat and corn in 1944 and we are facing large carryovers of these grains at the end of the current crop year. The increased utilization of grains for alcohol will help to hold down the carryover to more normal levels.

Safety at High Pressures*

Processing equipment using steam under pressure is dangerous unless properly constructed, installed and maintained. The same applies to refrigeration systems and air compressors. Here are some practical pointers

By W. C. NICOL, Hartford Steam Boiler Inspection & Insurance Co., Chicago, Ill.

SEVERAL States have adopted laws covering pressure vessels, and it has been the common practice to specify that newly constructed objects shall be built in accordance with the ASME Unfired Pressure Vessel Code. Users of pressure-vessel equipment will do well to ascertain whether there are such laws applicable to plants they operate. If failure of a pressure vessel were to occur, legal complications might develop if the object did not comply with the legal requirements.

Fusion welding has been used for the construction of many types of pressure vessels. Whereas the quality of fusion welding that is being done today is far better than that previously found, the process must be used intelligently or failures are certain to occur. Many of the vessels used in refrigerating systems built some years ago were very poorly welded and there have been many failures. We have developed a trepanning saw for the removal of plugs from welded seams, and a very large number of dangerously defective vessels have been found in this manner.

Consideration must also be given to the construction of vessels that may be subjected to vacuum, either purposely or accidentally. It is not at all certain that a vessel which will safely withstand an internal pressure of 30, 40 or 50 lb., or even more, will not collapse under even a partial vacuum.

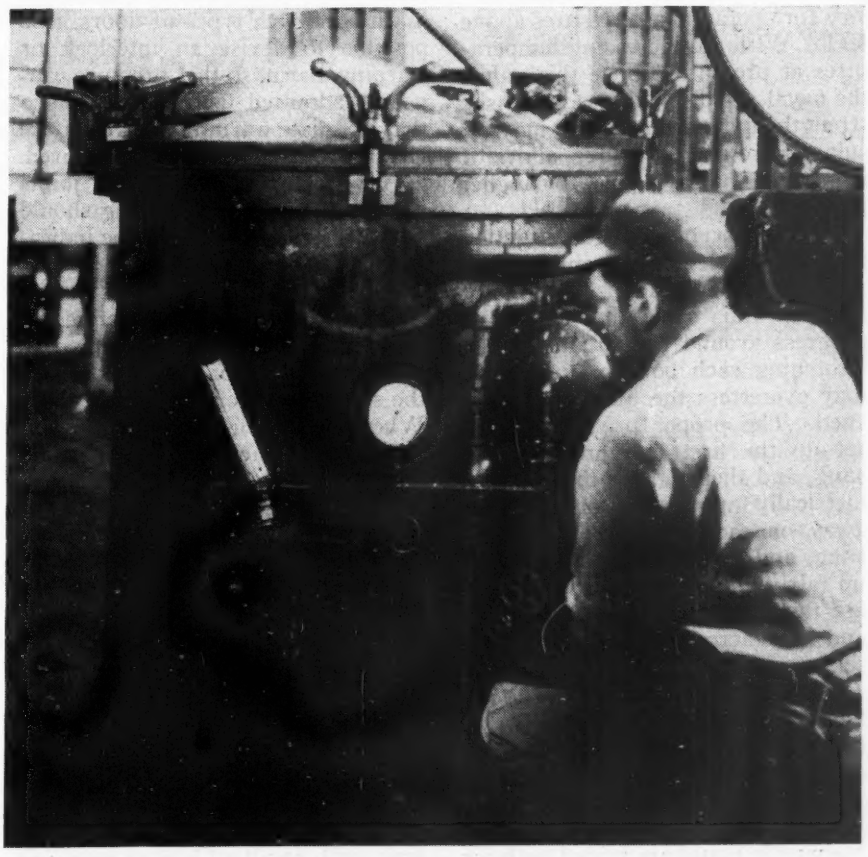
In installing pressure vessels, the most important precaution is protection of the vessel against the application of excessive pressure. It is customary to provide a pressure-reducing valve between the boiler and the vessel supplied with steam. And safe practices call for a safety valve in the steam line somewhere between the reducing valve and the vessels. It is important that this safety valve be large enough to relieve such a volume of steam that the pressure cannot rise even though the reducing valve is not functioning as it should.

It is common practice to install a bypass line around a reducing valve, and operators have been known to open the valve in the bypass line if the reducing valve does not operate properly. Such a practice may very readily lead to unsafe pressures on retorts, jacketed kettles or other vessels using steam unless there is a safety valve.

In the food industry, vessels frequently are sterilized with steam. If a closed vessel is so treated, there is a possibility of a vacuum developing within it by condensation of the steam. To prevent collapse, the vessel either should be constructed to safely withstand a full vacuum or should be equipped with adequate devices to prevent or break a vacuum.

It has been repeatedly demonstrated that an area of high local stress in a pressure vessel is very susceptible to corrosion. When corrosion does take place in such areas, the metal is reduced in thickness, the stress is thereby increased, and attack by corrosion is accelerated. Where high local stresses cannot be avoided, provision should be made to prevent corrosion.

Vessels subjected to corrosion or erosion should be provided with so-called "blind telltale holes," at least



Careless tightening of bolts on pressure vessels with removable heads, such as retorts, is a source of trouble. The author explains the safe technic.

*From a paper presented before National Safety Council.

in the area where wastage is most likely to occur. Such holes, usually ⅛ to ¼ in. in diameter, are drilled in the side of the plate opposite to that subjected to deterioration and to such a depth that a warning is given, by leakage through the holes, when the wastage has reached a permissible limit.

Careful thought should be given to the type of employees who are operating pressure vessels. Certainly, the least that can be done is to make sure that employees who operate such equipment are fully cognizant of the dangers that exist. Possibly the greatest offense in this respect from the standpoint of safety is that of applying pressures beyond that for which the equipment was intended. Such practices sometimes have been followed to speed up processes, with the result that "haste makes waste."

It is more and more becoming the practice to install automatic controls on all kinds of manufacturing equipment. Although these automatic devices usually are reliable, they must be maintained in good working condition. And operators should not place blind faith in them.

It should be noted particularly that vessels constructed of a certain grade of aluminum are not satisfactory for operation at pressures above 40 lb. With the increasing temperatures at pressures above this value, the metal rapidly will lose its tensile strength, and sudden failure may result. There are, of course, alloys of aluminum that are used for higher pressures.

Careless or unintelligent tightening of the bolts on pressure vessels with removable heads is a source of trouble. It is often the practice to progress around the circumference, tightening each bolt in turn. This may overstress the first bolts tightened. The proper procedure is to set up the first bolt until it feels snug, and then tighten the bolt diametrically opposite. Bolts 90 deg. away on each side are then made snug, and all four may be then set up fairly tight. The remaining bolts are then tightened by working back and forth across the head of the vessel.

Many plants have occasion to use flammable liquids that must be moved from one vessel to another, and it sometimes is the practice to use compressed air to cause the liquid to flow. When the vapors of a flammable liquid are mixed with air, only a spark is needed to cause a destructive explosion. The use of inert gas is considered the better practice.

While in the food industry today, extensive use is made of materials that do not readily corrode, there is, nevertheless, the possibility of erosion. In vessels with agitating devices, the continual movement of the contents may, and has, caused a definite wearing away of the metal surface. The erosion that occurs in this manner is usually so uniform that it readily escapes notice. The use of templates to check the contour of the surface against the original, or the provision of telltale holes, may well be given consideration as a means of avoiding failures.

It is particularly important on vessels that have removable covers that the devices used to secure these covers be kept in the best of condition. The bolts and nuts used for this purpose are subject to wear from constant use, and they should be inspected at regular intervals.

Some vessels are equipped with so-called quick-opening doors that are provided with locking devices operating on the inside of the vessel so that it is difficult to determine from the outside that the door is securely locked when it is closed. Then there are doors that have outside locking devices with which the operators are inclined to take chances. With both such types of doors, it is possible to devise an interlock or warning alarm, so that pressure cannot be admitted to the vessel or so that adequate warning is given if the locking device is not fully secured.

Any leakage that occurs at joints of pressure vessels or piping should not be overlooked. It may be indicative of a hidden defect, or it may cause external corrosion.

In refrigerating plants, ammonia cooling coils may be submerged in salt brine tanks, or brine coolers of the shell-and-tube type may be used. Wherever there is salt brine there is a possibility of corrosion of the piping, usually in the form of pitting. Although no widespread damage would be expected to result from a pithole in a pipe, such an opening will cause the loss of both ammonia and brine and thus involve considerable expense and time in returning the system to normal operation. There is also the possibility in submerged brine coils using cast iron fittings that a condition known as "graphitization" of the cast iron may take place. Such a deterioration results in eventual failure of the fitting, with resultant loss of ammonia and brine. So a definite program of periodic inspection of coils or fittings submerged in brine should be instituted.

Many plants use compressed air and, therefore, have an air compressor and air tanks or receivers. It is important that air receivers be installed so that they may be readily and completely drained. Compression of air causes moisture to separate and deposit in the tank. That moisture is, of course, saturated with air and is thus very corrosive.

It also is important that adequate inspection openings be provided to permit examination of the interior surfaces.

Some of the most violent air receiver explosions have been caused by combustion within the vessel. If the valves of a compressor are not kept in good condition the temperature rise due to compression will be excessive. If excessive oil is used for lubrication, an oily deposit collects in the discharge line, and this, being bathed by the heated air, gradually becomes carbonized. Such oil-soaked carbon deposits when continuously bathed with heated air may produce spontaneous ignition. If, when this occurs, there is an explosive mixture of oil and air within the system a very disastrous explosion may result. To avoid such occurrences, a maintenance program should be established to check frequently upon the condition of the compressor valves and also to wash out the compressed air line. The error should not be made of using a flammable solvent to remove these deposits. The proper practice is to use a hot soap or caustic soda solution.

Safety valves should be provided with testing levers so that they may be checked frequently for free operation. And the valves should be sealed in some manner to prevent their being tampered with.

The connection between a pressure vessel and the safety valve may, under some conditions of operation, become obstructed with the substance being processed. Frequent inspections are necessary to make sure that such a condition does not develop. Pressure gages also should be checked from time to time to see that they are giving true readings.

It cannot be too strongly emphasized that when repairs become necessary they should be made only by experienced persons. This statement is particularly true of repairs by fusion welding which, if properly applied is a satisfactory method, but if done by incompetent workmen, is a source of costly failures.

Keeping Up With Wage Rulings

Four recent outstanding developments which affect the employer's right to give wage and salary increases are explained in detail by the author

By C. O. COOL, Director, Labor Relations Institute, New York, N. Y.

It takes a lot of workers in the preparation departments of food processing plants to maintain the wartime production level. And with restrictions on wages, it has been a problem to hold workers in areas where there are defense plants. It therefore pays management to study closely what is permissible in the way of wage adjustments.

IN the midst of more dramatic developments along the labor front, such as manpower priorities, employers must not overlook the almost month-to-month changes in wage and salary stabilization. Recent reports prepared by our Industrial Division on this subject have explained in detail four outstanding developments which further affect or restrict the employer's right to give increases. These changes in the wage and salary stabilization picture consist of the following:

1. Limitations on the percentage of new workers who may be hired above the minimum in the rate range.
2. A new procedure on general increases which preserves established differentials.
3. The development of a consistent policy on "fringe raises" by the Regional War Labor Boards.
4. Disclosure that Treasury-controlled executives, administrators and professional employees have a better chance for increases than had previously been expected.

Hiring Above Minimum

The War Labor Board has amended its General Order 31 by restricting the number of employees who may be hired at rates above the minimum for a particular job classification. Under the old rule, a company could hire employees at any figure within the rate range, provided the workers had the experience and aptitude to warrant a higher-than-minimum wage or salary.

Under the new regulation, which applies to all employers with 31 or more workers, only 25 percent of the new workers within a yearly period can be paid above the minimum to start. The other 75 percent may not be paid more than the bottom of the rate range for the job.

The percentage limitation formerly was based on job classifications, but now is based on plant-wide personnel. For example, within the next year a company plans to hire 20 people. Fifteen of the new men—75 percent—must be hired at the minimum for their particular classifications. The remaining 5 may be paid a rate anywhere within their proper rate ranges, if they have the experience to back up the higher-than-minimum scale.

If less than four workers are hired, only one of these newcomers may be hired at a rate in excess of the minimum. For instance, if three office workers are hired, and the rate range is $25 to $35, one girl may be paid more than $25.

The obvious caution to be observed is this: Don't squander your 25 percent allotment on average or mediocre applicants. Workers who really deserve the differential above the minimum may come along *after* your quota has been exhausted.

Newly hired employees to staff new departments or new plants are also covered in the new regulations. During the first year of operation, 50 percent of the new employees of a new department or plant may be hired at rates above the minimum. After the first year, only 25 percent of the employees may be so engaged.

Preserving Differentials

Under the new procedure, if the War Labor Board approves a new rate bracket, all employees covered by the range can be moved up without further approval, thus preserving established differentials — *provided the average rate does not exceed the midpoint of the new range.*

Here is how the new rule works:

An employer has 10 employees in a department. The rate range approved by the WLB is 60 to 80 cents. The midpoint of the range is 70 cents. The employer raises two employees from 70 to 75 cents, two from 65 to 70 cents, two from 62½ to 67½ cents, two from 60 to 65 cents and two from 55 to 60 cents. The average rate is now 67½ cents, which is less than the midpoint of the range—70 cents.

Only one figure in this instance—75 cents—exceeds the midpoint of the range. Because it is 5 cents over the midpoint, the nickel must be deducted from the individual worker's budget under General Order 31. The rest are below the midpoint, and need not be included as part of the merit and length-of-service increase budget.

"Fringe Raises"

"Fringe raises," as defined by the WLB, consist of such nondirect wage benefits as night-shift differentials, call-in pay, year-end bonuses, recruitment bonuses, suggestion bonuses, paid meals, sick-leave plans, and so forth. All such benefits require WLB approval, depending in the main upon the practice in the industry. Once approved, they become an integral part of the wage structure.

Following, in detail, is the WLB policy on the various "fringe" issues, as compiled by the Field Staff of the Labor Relations Institute.

Night-shift Differentials—Unless the practice would be entirely new to your industry, the War Labor Board will approve applications for payment of a night-shift differential. It has been the Board's policy to grant up to 10 cents an hour, or 10 percent of the hourly wage, whichever is the higher, for the third shift, and 5 cents for the second shift.

Call-in Pay—The regional Boards have adopted a general practice of granting pay *for not more than four hours* in cases where an employee has reported for work and finds that he is not needed.

Recruitment Bonus — Cash bonuses of $10 and $25 have been allowed by the WLB as rewards to employees who recruit new workers. While approval for such bonuses is not required in some areas, it is safest to take no chances. File Form One with your local Wage-Hour Division.

Suggestion Bonus—No approval is needed on bonuses given for worthwhile employee suggestions which are actually used and which effect real savings. However, the plan must not function as a hidden wage increase, and the awards must not exceed the value of the contribution for which they are paid.

Paid Meals—The WLB will seldom turn down a request for payment of a half-hour lunch period for workers who are engaged in continuous-shift operations. It will also grant permission to pay for dinners in cases where the workers are required to work *three hours or more* beyond the normally scheduled workday.

Sick Leave Plans—These will be approved by the regional Boards, provided they are reasonable and do not constitute a hidden wage increase. But it is still a serious violation to pay for unused sick leave.

Severance Pay — It has been the Board's policy in the past never to grant severance pay in dispute cases, but to go along with unions and employers on reasonable severance-pay setups agreed to by both parties. However, in the new "Little Steel" decision, the Board *ordered* the union and the companies to work out a plan and submit it for approval within 60 days. The implication here is that if the parties do not agree on a severance-pay plan, the WLB will impose one of its own.

Guaranteed Annual Wage — Imposition of any such wage is "out" for the present, pending study of the whole question by a special committee or commission. In its recent "Little Steel" decision, the Board asked the President to appoint such a body.

Holidays—It has been the Board's established policy to grant six holidays a year — Thanksgiving Day, January 1st, July 4th, Labor Day, Christmas Day and Memorial Day. This policy was reaffirmed in the new "Little Steel" decision.

Treasury Liberal

Despite rumors to the contrary, the Treasury has granted almost 80 percent of all salary increases requested by employers, and nearly all salary rate schedules presented to the Salary Stabilization Unit have been approved, thereby making more merit increases available. In making this data public, Assistant Secretary John L. Sullivan also revealed that the net average increase given by the SSU since October, 1942, has been 14.2 percent. These figures should reassure the employer who hesitates to seek salary raises on the assumption that the Treasury "would probably turn me down."

Salary increases will be considered by the SSU if requested for the following purposes:

To Correct Inequities—If WLB or SSU increases to one group of workers has thrown the wage relationships of other workers out of line, the SSU probably will make a correcting adjustment in the latters' salaries.

To Compensate for Increased Duties and Responsibilities—This does not mean added work, as is sometimes thought. It specifically applies to an enlargement of the employee's authority and supervision.

To Fill New Positions—The new Form SSU-2 must be filed for these.

To Reward Merit and Length of Service — These increases can be made automatically, without approval, if you have a regularly established plan in effect. In the absence of such a plan, you may request *individual* merit and length-of-service increases, on which the limitation is 15 percent.

To Offset Rise in Cost of Living—Here, too, you can apply for relief, but you are limited to the "Little Steel" formula of 15 percent.

To Compensate for Overtime—While the Treasury refuses to approve overtime payments to workers under its control, it does permit slight raises for those who have to put in many extra hours.

To Aid in Prosecution of War or Other Special Demanding Reasons—Under this clause, if you find that you are losing key employees to higher-paying firms, you may ask the SSU for relief. While the latter disclaims the use of its offices for the purpose of controlling the flow of manpower, it will extend a helping hand if your case is justified.

In 1944, the War Labor Board allowed employers to pay Christmas or year-end bonuses, up to the amount of $25, without approval. The new "$25 Rule," of course, was confined to those employees earning less than $5,000 a year, who were not professionals, executives or administrators and who did not belong to a union.

The Board's rules still permitted the payment of the same fixed-sum bonuses to employees as in 1943. But any changes in the bonus required WLB approval.

The Treasury has a "$25 Rule" which is an approximate counterpart of the LB's. But definite approval *is* required.

There are four other methods of paying year-end bonuses, but these will not be given in detail, since the year-end has passed.

Conclusion

In summing up these major developments, it is worth noting that only one—the rule curbing employment of new workers at higher-than-minimum rates for the job—is in any sense restrictive. The others improve or emphasize the employer's ability to secure action from the stabilization authorities, provided the requests are reasonable and justified.

NUTRITION IS GOING UP

This study reveals that the nutritional value of the average diet has increased far above the rise in the quantity of food consumed during the years since 1930

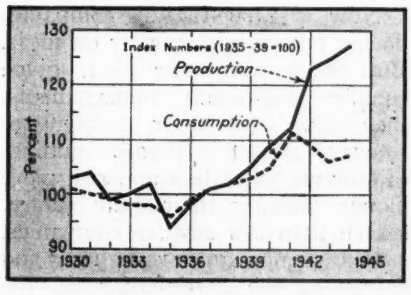
NUTRITIONAL analysis of the average diet for each year beginning with 1930 indicates an overall improvement with relatively small variations as compared with production and consumption. A summary issued by the Department of Agriculture indicates that production rose about 35 percent from the lowpoint year of 1935 to the peak year 1944. Consumption, on the other hand, increased only 15 percent from the low year, which was also 1935, to its peak in 1941. In 1942 consumption dropped three percent under 1941 and in 1943 there was another decline, while 1944 shows a slight rise.

Despite these variations in production and consumption, nutrition seems to have followed along a path all its own. The vitamin A value in the food supply remained remarkably constant for 11 years and then rose sharply. About half of the vitamin A is supplied by plant products especially green and yellow vegetables. The remainder is furnished by animal products such as eggs, milk, butter and liver.

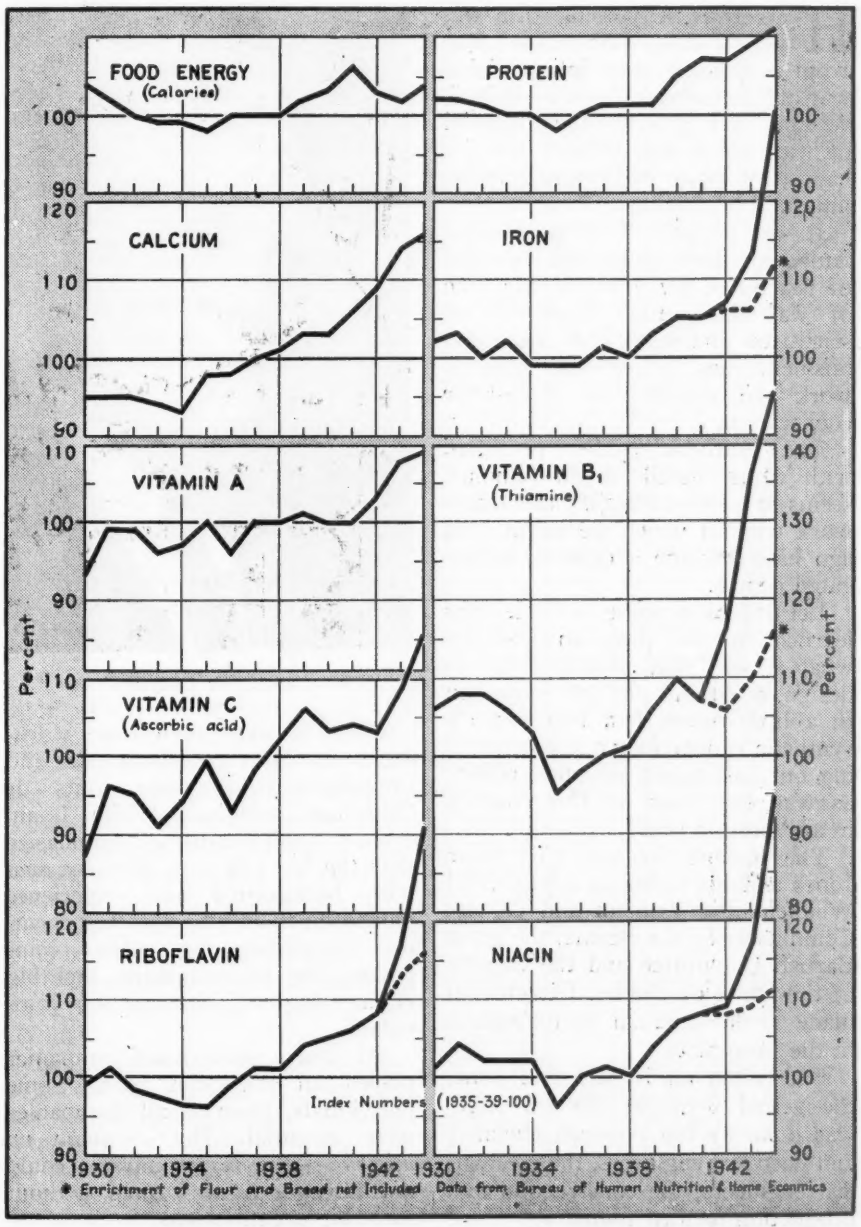
The flour enrichment program and the increased consumption of milk have contributed to the steady rise in the iron and vitamin B intake since 1930. The quantity of vitamin B_1 in 1944 was 44 percent higher than in 1935-39 and over 30 percent higher than it would have been without the enrichment program. The benefits of enrichment in 1944 were brought about by the stepped up program for flour and bread beginning October 1, 1943. With the consumption of milk and milk products, other than butter, increasing more than 25 percent since 1934, the total calcium intake has risen 24 percent while the riboflavin intake has gone up 21 percent as a result of the enrichment program. Enrichment also provided larger per capita proportions of iron and niacin.

Vitamin C has shown a definite uptrend since 1930. This upward trend is associated with increasing consumption of citrus fruit and tomatoes, which are rich in this vitamin. The estimated per capita intake of vitamin C has increased 28 percent since 1930 and the increase in consumption of citrus fruit and tomatoes has been approximately 50 percent. Tomatoes and citrus fruit furnished 30 percent of the total ascorbic acid in the food supply in 1943 as compared to 20 percent in 1930 and an average 24 percent in 1930-39.

(*Turn to page* 192)



Per capita U. S. food production and consumption from 1930 to 1944. (Bureau of Agricultural Economics, U. S. Department of Agriculture.)



Nutritive value of food consumed per capita in the United States from 1930 to 1944. (U. S. Department of Agriculture.)

Role of Organized Research In Our National Defense*

By BRADLEY DEWEY, President, Dewey & Almy Chemical Co., Cambridge, Mass.

Not long ago, powerful influences were casting doubt upon the social value of research by big companies and seeking emasculation of our patent system. Here is striking evidence of the vital value of such research and some pointers to a sound national postwar policy

HOW was it possible for this peace-loving nation to leap from a standing start into a global war and to surpass quickly—in both volume and quality—the material of war which our dictator enemies had spent years in scheming, planning and producing?

It was possible, I think, because American free enterprise in time of peace had given us for the time of war the needed teamwork of scientists and technical men and business men which was able to work the miracles of large-scale cooperation.

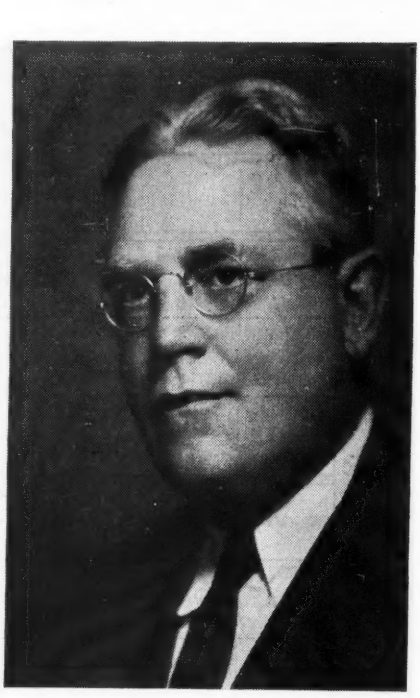
The synthetic rubber program, with whose details I am familiar, seems to me to exemplify this teamwork without which we might long ago have become a captive, subjugated people.

Let us look at some of the lessons learned in this program and see what it was that permitted us to design, build and put into operation in a little more than two years a synthetic rubber industry now turning out half again as much rubber as was ever used in this country in any prewar year.

The Rubber Reserve Co., Jesse Jones and his technical advisor, Ed Weidlein, the Truman and Gillette Committees of the Senate, the great Baruch Committee and the experts of the Office of Rubber Director all made their essential contributions to the program.

But, when all is said and done, the actual work in the *job itself* was *done* by the research chemists and chemical engineers, the mechanical engineers, the construction and production men of industry.

*From speech before Society of Chemical Industry.



BRADLEY DEWEY

Most of these men were working in teams in the laboratories and organizations of large units of American business. While I am from a small business, I emphasize that the big job was done by men with background and experience gained on their jobs with big chemical companies, big rubber companies, big oil companies and big engineering and construction companies.

Of course, some small companies played an important part. Some individuals from small companies were essential. But — *make no mistake* — the *major* miracle could not have been performed without these big organizations.

Why was this so?

In the first place, even with the knowledge brought to this country by the much-abused companies with foreign contacts, the synthetic rubber industry could not have been built without a tremendous utilization of four great technological developments of the last two decades.

These were, first, high-temperature catalytic cracking for the production of monomeric materials. Second, prefabricated welding of piping and steel, field-welded in place. Third, high-alloy steels for superheating hydrocarbons as well as steam. And lastly, the control of temperatures, pressures and the flow of fluids within close limits by automatic control valves actuated by remote control instruments.

These tools had been developed so recently that only men who had gone through the grief of their development could possibly use or apply them effectively without long and extensive piloting. These men were in the large chemical, oil and rubber companies. Moreover, even these experts were faced with the necessity of using these new tools in plants built around reactions, many of which had never been piloted.

It took teamwork. All the overnight expansion was possible only because the leading chemists, chemical engineers, mechanical engineers and executives of many of these organizations had for a long time been working together as teams. *Their* technical staffs understood each other's methods yes, even their idiosyncrasies. *Banded into teams, they were accustomed to teamwork.*

Now, it is true that big companies do not have any monopoly on ideas. But, it is also true that, given equally discerning managements, they can, with their greater resources, attract a greater number of eminent specialists and risk more money backing their faith in research than can smaller companies.

With American boys fighting and dying on the battlefronts of the world, it is unthinkable that we should compare any sacrifice made on the home front with *their* sacrifices in the jungles, on the oceans

and in the deserts. But this does not mean that we should overlook that American business has been eager to do its best. Big business has sent its laboratories and engineers to war. They pooled their patents and their information that we and our allies might fight. In many cases, processes and procedures were disclosed so that promising plans for future competition had to be abandoned. Once released, secrets could not be called back.

As everyone knows, patents were made available to competitors, often royalty-free for the duration and at nominal royalties thereafter. Many big companies have built up competitive capacity which in years to come will surely haunt them. They have made it possible for enterprising small businesses to become large and to compete with them. They are operating government plants at purely nominal fees.

The contribution by big business to the synthetic rubber program is but one of many which has permitted our soldiers to go into the field better equipped than those of any other country.

The research laboratories of the great oil companies contributed to the high-octane program their basic information on catalysis. Chemical engineers in the industry, including the big equipment firms, engineered and built the high octane plants so that now our bombers and our transports fly all over the world with fuel of a quality unheard of before the war.

In the fields of metallurgy, light alloys, plastics, explosives, foods and textiles—in fact, in all the great process industries—it is the well-integrated, capably trained groups of researchers and engineers that are doing a job Hitler said, and bet, we could not do.

Turning now to the fabricating and assembly industries — such as the automotive industry, the can-making and packaging industries, the electrical equipment industry—they too are lending to the war effort teams of men trained in their methods of production. Under the guidance of these teams pour forth the machine guns, airplanes, anti-aircraft guns, radar parts and a thousand and one new things we lacked at Pearl Harbor and which our enemies believed it would require us years to build.

The situation with respect to research is somewhat different in these fabricating and assembly industries from that in the process industries. For them it is possible, often advisable, that research be conducted outside their own research laboratories. Much of it is now being done by the armed services. Much is being done by the National Defense Research Council and its remarkable laboratories, largely staffed by the leading physicists, chemists and engineers from our universities. Where the production problems start with a drawing and a model is turned out and tested by the laboratory, the close relationship between the research laboratory and the engineering and production groups, so necessary in the metallurgical and process fields, is not so vital.

These We Must Do

We who know the story of the part big business and its teams of researchers, engineers, and production men have played in fighting this technological war have a duty to the future. We must see that the lessons learned are not forgotten.

The government itself must surely in the future accept the full responsibility for seeing to it that our vitally needed young technical men, regardless of any understandable desire to fight, are not siphoned off to armed regiments but remain where they are most needed on the industrial and research fronts.

We must be alert to combat—by using our rights of free speech—the false doctrines of those who would check or halt research.

We must guard the nation against the soft and foolish notion that research and development have to stop when war is declared. And, equally, we must guard against the abandonment of essential military research when peace comes.

Above all, we must remember that in many cases it was the teamwork of scientists, engineers and production men in big industry which saved us on the production front in this war.

We must keep these teams intact and healthy so that we may turn to them when future danger threatens.

Effect on the Future

Now, how should all this experience affect our thinking and our actions in the future?

In many parts of the world in the last decade, free speech has been suppressed. In our own country there has been a confused fear which has kept many of us from speaking out our beliefs. We have been all too prone to say: "Unscrupulous theorists are in power. I will keep out of sight. I will not stick out my neck. Let George do it."

It is this philosophy which caters to the social theorists. It gives them the chance to sell their doctrines unopposed; to interpret to the public our restraint as proof of guilt. The public can be trusted to reach the right answer—but only when all of the facts are fearlessly presented.

Why do I bring this up in a talk on the role of research and big business in national defense? Because not many years ago, powerful influences were at work casting doubt upon the social values of research, rearing the bugaboo of technological unemployment and seeking the emasculation of our patent system. It is true that a few fearless men —notably Karl T. Compton—spoke out against this. But all too many scientists, engineers and business executives were quiet. Research weathered the storm at that time. But we must be on our guard to see to it that no such ideas ever take root again.

Psychologists have said that no movement like that of Nazism could have gotten underway without a whipping boy, and that if Hitler had not had a race to persecute he would have had to find or synthesize another minority as a target for the public rage he stirred up so that he and his ruffians might seize the reins of power.

In this country fast-growing big business—which, being human, unquestionably in the past was guilty of mistakes—has been cast in the role of whipping boy by some politicians in their lust for power or for insecure security or in their loss of confidence in the American pioneering spirit.

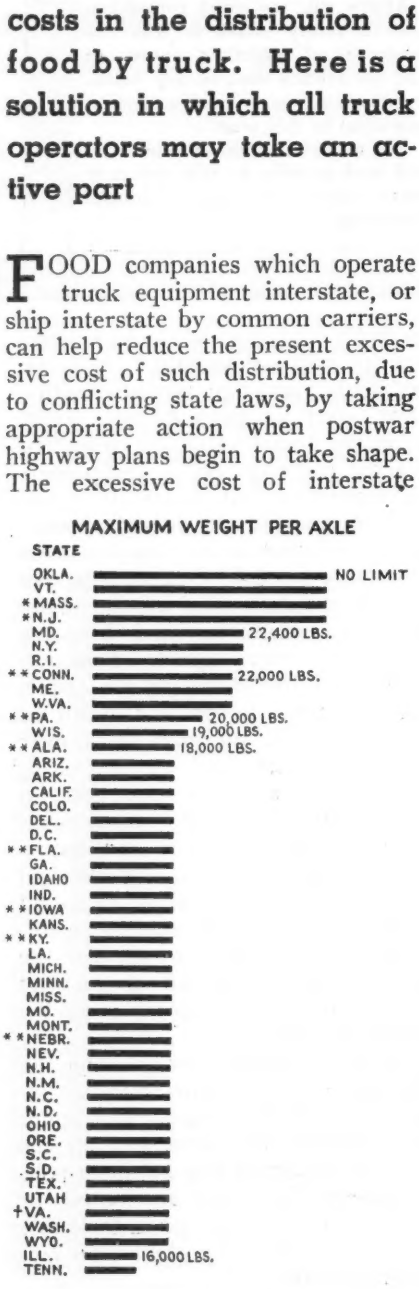
That America, armed and powerful, must remain alerted for war for a long time to come seems to me to go without saying. But let us keep uppermost in our minds that any future war will be technological, will draw even more heavily than the present war upon

(*Turn to page* 188)

Interstate Truckers Need Uniform Code

The present conflicting state laws act as trade barriers, creating excessive costs in the distribution of food by truck. Here is a solution in which all truck operators may take an active part

FOOD companies which operate truck equipment interstate, or ship interstate by common carriers, can help reduce the present excessive cost of such distribution, due to conflicting state laws, by taking appropriate action when postwar highway plans begin to take shape. The excessive cost of interstate truck distribution results from the great variations among the state codes as to size and length of the vehicle that may be used, the allowable axle loads, the gross pay loads, and many other punitive taxes and restrictions.



*Restriction is based on tires.
**Changed to the figure shown on a temporary war-time basis only.
†On certain designated highways—other highways, 16,000 lbs.

The maximum weight per axle permitted by each state does not always mean what it seems to indicate, since the gross weight limitations often are lower than the total weight allowed for each tractor-trailer axle.

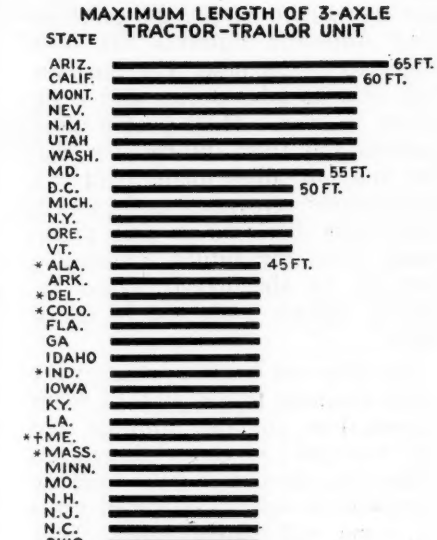
Work toward achieving some uniformity in the state motor vehicle codes had reached an advanced stage at the outbreak of the war. Then in the spring of 1942, the governors of all the states met with Federal officials and agreed upon slightly more favorable limits on size and weight in all states for the duration of the war. The old laws, however, still remain on the statute books. When the states revert to their peacetime standards, the problem will again become acute.

Thirty of the states have prewar laws which are more restrictive than the temporary standards agreed upon at the governors' conference. Kentucky, an outstanding example, now permits a 40,000-lb. gross weight for a tractor and semi-trailer unit, but under prewar laws the state restricted such vehicles to 18,000 lb.

It is apparent, then, that the food distributor who operates trucks running interstate is limited both in vehicle size and weight of load to the most restrictive states, even though larger sizes and loads are legal in the distributor's home state. To rectify these inequitable conditions, food companies can help by taking up the matter through their trade and truck associations and their local chambers of commerce, where petitions can be drawn requesting the Federal government to sponsor a program for greater uniformity in vehicle laws.

These May Help

Local chambers of commerce are at present considering a resolution of the U. S. Chamber of Commerce, which states, in part: "The free flow of interstate commerce requires that the Federal government prescribe minimum standards for size and weight limitations applicable to commercial vehicles operating on interstate highways." The American Trucking Association, moreover, has adopted a resolution calling upon Congress to assure equitable state laws by providing that Federal highway aid be denied to those states whose laws do not conform to a specified Federal set of standards.



*Changed to the figure shown on a temporary war-emergency basis only.
**Permit 45 ft. for the duration when transporting petroleum products or war materials.
***Allows "over 35 ft." for duration, but no definite figure given.
†Trailer limited to 26 ft.

Here is how the various states stand on the maximum length of 3-axle tractor-trailer units. The interstate truck operator is thus limited to the lengths permitted by the most restrictive states.

Many details of the trade barriers set up by the conflicting state laws are described in the booklet entitled "Are the United States United?" published by the Fruehauf Trailer Co., Detroit, Mich., and from which the charts shown herewith are reproduced. The booklet points out that the vehicles are limited by three principal items: maximum weight per axle, overall vehicle length, and maximum weight of vehicle load.

The maximum weight per axle varies from no limit in Oklahoma, Vermont, Massachusetts and New Jersey to 16,000 lb. in Illinois and Tennessee. Likewise, the maximum length of a three-axle tractor and semi-trailer unit varies from 65 ft.

in Arizona to 35 ft. in Illinois, Kansas and Tennessee.

The legal and actual maximum gross weight of vehicle and load are not necessarily the same. It is usually impossible to obtain the maximum allowable axle load on the front axle of a truck or tractor. This is because of the location of the engine and the driver's cab and the necessity of steering with the front wheels.

In Massachusetts, the maximum gross weight is determined by the rated load-carrying capacity of the tires. In the other states the practical gross weight varies from 60,000 lb. in New Jersey down to 38,000 lb. in Texas.

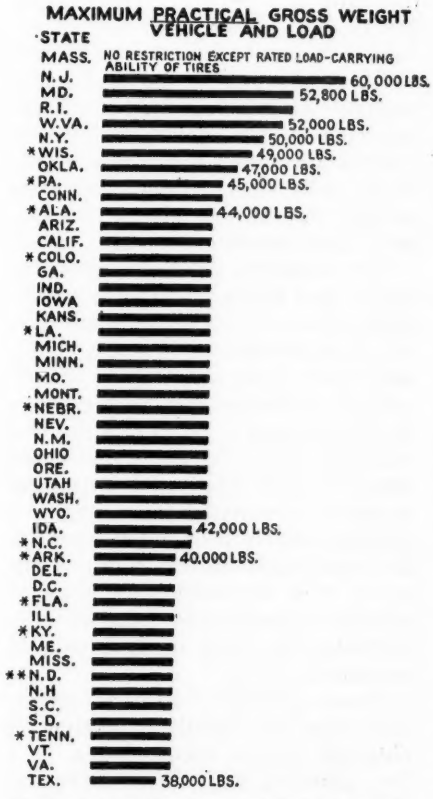
Axle Load Limits

In effect, the safe legal axle load limits do not mean what they say, because 13 states with 18,000-lb. axle loads limit the gross weight to 40,000 lb. On a three-axle tractor-trailer unit with an actual loading of 8,000 lb. on the front tractor axle and 18,000 lb. each on the rear tractor and trailer axles, the allowed axle loadings should permit a gross weight of 44,000 lb. Yet, the gross-weight limitation permits only 40,000 lb.

State highway engineers answer this apparent inconsistency by saying that some of the bridges cannot carry more than the 40,000 lb. maximum gross load. This is a tacit admission that many bridges are weak links in chains of modern highways capable of carrying more than existing limits. The truck user might ask if a state's entire highway system should be wasted because of a few weak bridges. He might further inquire why the weak bridges cannot be strengthened to equal the capacity of the roads along which they are located. At least, the truck user insists, the weak bridges should be posted so that their vehicles could be rerouted.

The uniformity of vehicle size and weight has also been considered by the Society of Automotive Engineers.

This group recommends an overall maximum length of 65 ft., an axle loading of 20,000 lb., with low-pressure balloon tires, and no gross-weight limitation. The SAE also recommends a height of 13.5 ft. and a width of 102 in. as compared with existing limits respectively of 12.5 ft. and 96 inches.



*Changed to the figure shown on a temporary war-emergency basis only.
**Vehicles carrying petroleum products or war materials permitted 44,000 pounds.

These maximum gross weights do not necessarily conform to the greatest legal allowances because, in many cases, vehicle design or superseding restrictions make it impossible to attain these weights.

Flame Peeler Cuts Loss In Potato Chip Plant

Small-scale operating data compare peeling losses for the flame and abrasive potato peeling methods

By C. R. DOOLIN, President, The Frito Co., Dallas, Tex.

STARTING in the potato chip business in 1939, we secured a flame peeler and installed it in our Dallas plant. We encountered some mechanical difficulties with the peeler and were therefore unable to use it extensively. We did use the flame peeler in a limited way and we have accumulated some interesting data in spite of mechanical troubles we had.

In addition to operating the Dallas plant on potato chips, we also operate a plant at San Antonio and one at Tulsa. Both in the San Antonio and Tulsa operations the potatoes were peeled by the abrasive peeler method.

In the San Antonio plant from March, 1940, to May, 1940, we peeled 656 100-lb. bags using abrasive methods. We had a 100-bag lot in which we had the lowest loss of 10.3 percent. The peeling and trimming losses in the balance ranged from 15 to 18½ percent.

In the Tulsa plant, also using the abrasive peeler method, we peeled 516 100-lb. bags with losses here ranging from 12 to 20 percent.

At Dallas, using the flame peeler, we peeled a total of 4,768 100-lb. bags of potatoes. The lowest peeling and trimming losses we had here were on a 60-bag lot of potatoes that had been washed. The loss was only 1.97 percent in that case. Throughout three years of operation, the losses ranged from about 3 percent up to a high of 16.11 percent, averaging around 9½ percent.

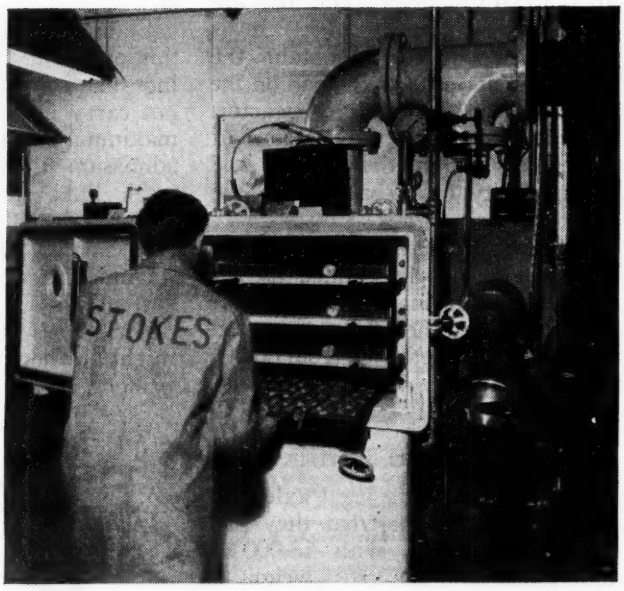
It will be observed that in round figures the flame peeler saved from 5 to 6 percent of stock over the abrasive peeler method. In addition to this, generally speaking, the potatoes that came from the flame peeler seemed to have been cleaner looking than the ones that came from the abrasive peeler. The chips produced from the flame peeler were cleaner looking, showing less peel in the bag. The operation was more economical with the flame peeler because of the saving in raw material, thus making the operation more profitable.

EDITOR'S NOTE: *The figures given here are for the manufacture of potato chips. In this case, close trimming requirements, such as are required for dehydrated or canned potatoes, are not necessary, so allowance should be made in comparing peeling and trimming losses as reported here with the usual losses recorded in dehydration or canning operations.*

DRYING BY SUBLIMATION

Low temperature and high vacuum work together to produce palatable dehydrated juices, meat and milk. Here are the theory and the practice—costs and possible uses, with the how and why of the equipment and the results

By EARL W. FLOSDORF,
F. J. Stokes Machine Co., Philadelphia, Pa.



Vacuum dryer for batch drying, with external jacket and hollow shelves through which the heat exchange medium circulates. This is the dryer in the pilot plant, here being used to dry clams.

REMOVAL of the water from the product while it is frozen is the basic principle of drying by sublimation. This locks the molecular structure so that changes cannot occur during dehydration. It also prevents bacteriological action. Further, drying at very low temperature reduces to a minimum the loss of the highly volatile components.

In general, drying from the frozen state produces less change in physical, chemical and nutritional characteristics than any other method of dehydration. Even some of the most delicate medicinal products, such as viruses and bacteria, are unchanged and may be kept alive for years after drying in this way.

Of the various chemical components which have been studied in relation to desiccation from the frozen state, proteins have perhaps received the most attention. Generally, no chemical alteration detectable by ordinary methods occurs. Electrophoretic patterns of plasma dried by sublimation have presented a normal appearance with normal values. With the proper degree of dryness, changes do not occur during subsequent storage for reasonable periods.

Fats show no chemical change during frozen state drying, but undergo oxidation in subsequent storage and tend to become rancid if oxygen is not entirely excluded. Since this occurs even if the fats are completely and properly desiccated and kept in a moisture-free condition, packing *in vacuo* or under an inert gas is required. On the other hand, if the residual moisture is low enough, hydrolysis takes place so slowly that no problem is encountered from this cause.

Foods were first reported to have been dried by sublimation in 1935[1] by using procedures and developments, completed at about that time, which led up to the blood plasma program of the second World War. This can produce dehydrated foods which have a high quality and are not merely acceptable under wartime emergency conditions. After drying by sublimation, such widely varying foods as raw meat and orange juice are scarcely distinguishable from the freshly prepared original products. Although milk, fruit juices and other products had been dried in this laboratory in this way as far back as 1935, the engineering of the method has only recently been brought to the point where it can be applied with a satisfactory commercial economy.

Much of the development, as far as medicinal products such as blood plasma and penicillin are concerned, has been centered around drying in the ampoules or bottles in which the dried materials are stored and distributed.[2] As such, these developments are not applicable to foods. The present paper will discuss the principles which underly drying by sublimation with particular reference to the industrial conditions required for foods and other products in larger tonnage.

Flavor Stability

Orange juice offers great promise for drying by sublimation. Not only are problems of juicing and of garbage disposal eliminated in institutional use, in dining cars and the like, but dehydrated orange juice also offers a greatly expanding market around the world where today distribution of fresh fruit is impracticable. This applies also to the juices of many tropical fruits, such as those of guava, naranjilla and papaya. Even dehydrated pineapple juice may be brought to the American market with a flavor which only those who have been fortunate enough to travel to places like Hawaii have tasted.

The qualities of rapid reconstitution and flavor are such that dehydrated cow's milk may some time find a wide market. But for goat's milk there is an outstanding opportunity. A strong odor may develop in liquid goat's milk during distribution. By drying from the frozen state this is avoided, and drug-store counters eventually may carry a product which people will find indistinguishable in taste from the cow's milk to which they may be allergic. Goat's milk dried or concentrated by other methods has an unnatural flavor.

From vegetables such as carrots and peas an excellent product is obtained which reconstitutes in a few minutes, with flavor comparable with those of frozen foods. With such products as these, however, the cost of the operation probably would prohibit application except for special purposes. Whole oysters, clams, fish fillets, raw meats, juices of berries such as strawberries, soups, corned beef and other

meat hashes, cooked cereals with milk or cream, tomato products, coffee (with or without cream) and milk, are some of the products offering interesting possibilities for specialty markets. They all have been dried successfully. Only water, hot or cold as required, need be added to make some of these ready for serving. Others, like oysters, are ready either to serve raw or to make a stew.

Pretreatment may be used — in the case of tomatoes, for example, to produce a puree, or in the case of orange juice to make a concentrate, which may be dried. It must be borne in mind, however, that the quality of the final product is no better than that of the material prepared for drying, so that no method of pretreatment or preconcentration must be used which will harm the quality. On the other hand, concentration may yield a product that, though satisfactory at the outset, lacks stability. Drying by sublimation can then stabilize the product at a much reduced cost and with increased output from the more expensive sublimation equipment.

Increased Solubility

Because of the highly dispersed nature of the solid material after drying in this way, it passes into solution quickly. Many products may be frozen or dried for the purpose of obtaining a product having a much higher rate of solubility than it had before drying. Gelatine dried in this manner, for instance, can be dissolved rapidly in cold water. Gelatine solutions are holding some promise as possible substitutes for blood plasma, and drying the gelatine solutions by sublimation beforehand produces a product which the clinicians can use readily. Preparing solutions by boiling, with the necessary cooling before injection, would make gelatine impracticable for transfusions, particularly under emergency conditions.

Numerous pharmaceutical preparations and drugs are now dried by sublimation, primarily because of the improved solubility as compared with ordinary drying.

Biological Activity

The biological activity of labile components in general is unaffected. For example, even vitamin C is maintained without loss during drying. Vitamins, hormones, enzymes and other labile components of many biological products have been studied, and it is shown that their activity is maintained without loss, both during drying and storage.

Lyophilic components, such as those of milk, are not affected colloidally, and the products reconstitute perfectly. Increased solubility in the case of gelatine was discussed in the preceding section. Other substances behave similarly.

Immunologically, little change in either serum, plasma or antigens is observed. With respect to foods, this condition is of particular importance with goat's milk, inasmuch as the major market for goat's milk depends upon its difference in immunological characteristics as compared with cow's milk. In this country it is supplied mostly to people who are sensitive or allergic to cow's milk.

Particularly in the presence of the milk proteins, the bacterial count is not changed as a result of drying, and during subsequent storage it is kept the same as it was at the outset. In other words, the count neither decreases, since organisms are not killed, nor does the count increase since, under the conditions of drying as well as subsequent storage, multiplication of the organisms is not possible. This is also true in the case of meats and explains why sublimed raw beef may be kept safely at room temperature for years.

This may all be summed up very simply: The reconstituted product will be neither better nor poorer than that with which one begins.

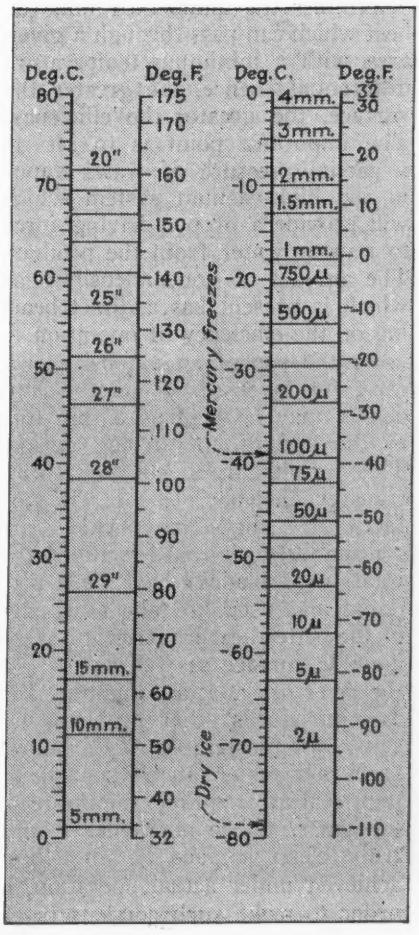


Fig. 1. Bailey temperature-vacuum conversion chart. On the left the pressures from 20 to 29 in. of vacuum are referred to 30 in. barometer. Pressures in millimeters, on the right, are absolute. μ equals 0.001 mm.

This may all be summed up very simply: The reconstituted product will be neither better nor poorer than that with which one begins.

Blanching Unnecessary

Generally speaking, the problems in pretreatment are fewer than for ordinary methods of dehydration. Blanching of products like carrots and peas is unnecessary. Not only do the conditions of drying prevent enzymatic change, but the moisture content is too low during storage to permit it. Reconstitution is also so rapid that there is no time for enzymatic action before the food is ready for use. In general, blanching is not necessary provided deterioration does not occur during the few minutes required for reconstitution. This is not the case with potatoes, but probably it will be a long time before a sublimation process will find application to such a low-cost food.

Meats do not require precooking. Within a very few minutes after opening a can of desiccated beef hamburger and adding water, a product with full native redness is obtained, indistinguishable from the fresh unprocessed meat. It may be cooked to a state of rareness or be well done, as desired. Even whole steaks may be so prepared.

Stabilizers for Juices

In the case of orange juice, often it is found to be of assistance to include a gelatine stabilizer or other similar substance in small amount.[3] Such a stabilizing solution may be used, along with sugar if desired, with products other than orange juice. In the case of lemon and lime juices, however, another problem is encountered. The ratio of acid to sugar is high, and the citric acid is reduced to such a low moisture content that its hygroscopic effect slowly carbonizes the sugar to a slight degree over a period of time. The product after reconstitution has, however, an excellent flavor.

Initial Freezing

In carrying out the process, the product to be dried must first be frozen. This may be done either by freezing before placing it in the

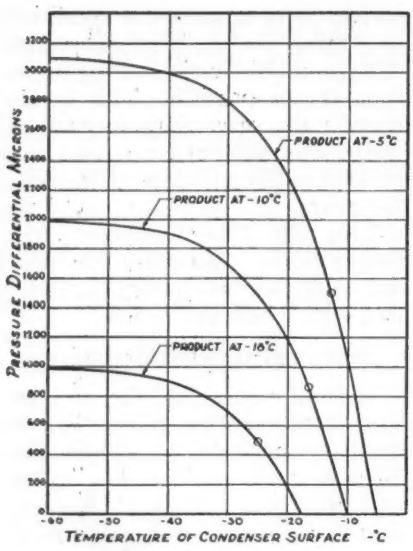


FIG. 2. Relation between temperature of condenser and the driving force for drying the product. The curves show the conditions for products being dried at three different temperatures. The actual temperature in drying varies, depending on the product being dried. The circle on each curve shows the maximum difference between product and condenser temperatures which is useful, according to the laws of adiabatic gaseous flow.

vacuum chamber or by self-freezing under vacuum, or by a combination of these procedures. The essential requirement usually is that freezing be rapid.

The rate of freezing is not entirely a function of the temperature of the freezing medium. It is a function of the rate of extraction of heat from the product. By combining external cooling of the container with evaporative cooling through application of vacuum, a temperature for prefreezing may be used which is above that at which the desiccation subsequently is carried out. Self-freezing may be accomplished by means of the vacuum alone, but in this case when the product is a liquid it is necessary to combine the application of the vacuum with a preliminary degassing which requires a gradual and controlled rate of evacuation.[2, 4]

Juice is conveniently handled by piping directly into the freezing shelves of the dryer. The finished crystals can be removed by tilting the dryer trays or by other automatic means. Being completely dry, the product is readily flowable, so that there is no difficulty with sticking. Raw meat, shellfish and other solids are frozen in trays which are then slid onto the dryer shelves and removed with the product after drying is completed.

Removal of Water Vapor

The most important consideration controlling the type of equipment to be used is the method selected for removing the water vapor under high vacuum. For industrial drying, two methods have been developed: Condensation at low temperature[2] and direct pumping[2, 5] (such as by means of multistage steam ejectors). Each of these methods possesses advantages. The choice depends upon factors such as the relative cost of power, steam and water, as well as the extent to which refrigeration already is available for freezing and other associated operations.

Refrigerated Condensers

When refrigerated condensers are used, selection of the operating temperature involves several factors, including the degree of vacuum in the system and the surface area of the condenser. The latter, in turn, involves the coefficient of heat transfer at the cold surface. The extent of the surface naturally determines the number of units of heat which can pass through a given area with a minimum temperature differential; hence, the greater the surface, the greater the efficiency. The important point is to set up a partial pressure of water vapor in the high-vacuum system which will provide a proper driving force to remove water from the product. The amount of noncondensible gas which is present has a direct bearing on the efficiency of operation.

By the use of an extensive surface, the layer of ice on the condenser may be kept as a thin film to the end of the drying period. This results in a constant heat-transfer efficiency. In contrast, surfaces of small area which are continuously de-iced (scraped by rotation of blades) have been proposed and used, to take advantage of the better heat transfer at a clean metallic surface as well as to keep the layer of ice at a minimum. But this introduces other problems because, for the scraper, high-vacuum stuffing boxes or other types of vacuum seal are required for the moving parts. Since maintenance of a truly clean surface has not been achieved under actual operation, in order to make such condensers effective lower temperatures must be used. The greater horsepower requirement more than offsets any economy gained.[2]

The net result of all of these several factors in combination may be expressed in terms of the effective partial pressure of water vapor which can be established within the vacuum system at the condenser surface during drying. Assuming that the equipment is properly designed so that there are no restrictive orifices in the vacuum lines and elsewhere, the differential between the pressure produced by the condenser and the vapor pressure of the evaporating product determines the theoretical maximum rate of drying. (The effect of the partial pressure of residual air in the system will be discussed later.) The vapor pressure of the product that corresponds to the temperature at which it should be dried determines the temperature at which the condenser must be operated. The chart in Fig. 1 shows the way in which the temperature varies with the vacuum required.

The temperature at which the

TABLE I—Orange Crystal Drying Plant—Estimate of Typical Production Costs.

Daily capacity	
Juice	48,000 lb.
Crystals[1]	4,800 lb.
Seasonal capacity[2]	
Crystals	720,000 lb.
Cost of producing 1 lb. of crystals, from straight juice	
Labor, estimated at $1.59 per hour	$0.02
Water	0.001
Steam	0.006
Electricity	0.09
Total[3]	$0.117

[1]The daily capacity in terms of crystals could be quadrupled by the use of a good concentrate.
[2]The seasonal capacity is based on 5 months' operation. It can be increased 8 times by holding frozen concentrate for 12 months' operation.
[3]Add cost of packaging in No. 2½ cans.

TABLE II—Production of Orange Juice Crystals by Sublimation Drying—Typical Estimate of Total Cost.

This is based on a daily capacity of 24 tons of juice, which would require about 1,000 boxes of fruit daily. Figures represent use of straight juice and 5 months' operation.

Drying	Cost per lb. crystals
Production, labor and power from Table I	$0.117
Juice, figured at $2.50 per box of fruit delivered, 13 percent solids, yielding 5 lb. of crystals per box	0.50
Extraction	0.04
Stabilizer[1]	0.023
Labor for packaging	0.01
Amortization	
Drying equipment (5 years)	0.065
Production plant	0.10
Container cost, using No. 2½ cans for 12½ oz. of crystals, and carton cost for 48 cans per case	0.056
Interest, overhead and royalty	0.156
Total cost per pound of finished product	$1.067

[1]Not required with the juice of all fruit, but in many cases a superior product may be obtained by the use of a stabilizer.

product must be maintained during drying is not the same for all products. Some, like orange juice, must be kept much colder than others. In Fig. 2 is shown the pressure differential produced by various temperatures of the condensing surface, in relation to three typical temperatures at which products may be kept during drying. This difference in pressure is a measure of the force which drives the water vapor out of the product.

It will be observed that for each of the several product temperatures, there is a temperature of the condenser surface below which very little increase in driving force is gained by further reducing the condenser temperature.

As drying proceeds, the drying rate is limited by the diffusion of vapor through the interstices of the porous dry outer layer of the product. These act as orifices. By the laws of adiabetic gaseous flow through orifices (Napier equation), a differential such that the vapor pressure at the surface of the condenser ice is 55 percent of the vapor pressure within the product is the greatest difference which is of any value in increasing the rate of drying. Points corresponding to the 55 percent values are marked by circles on the curves. This limitation in the theoretical maximum rate of drying has been borne out experimentally in pilot plant operation[2] where the temperature of the condenser was varied from –10 to –60 deg. C.

In drying by sublimation, the pressures are well above one micron so that the laws of flow of fluids apply to the movement of the water vapor. These laws are based upon the conditions of "screening" set up at an orifice when the down-stream pressure is decreased below the limiting values. This screening accounts for the failure to obtain faster flow as a result of a greater differential in pressure.*

This comparison of pressure differentials assumes that there are no restrictions in vapor lines or elsewhere in the high-vacuum system, because if there are, the temperature of the condensing surface must be reduced further to produce a lower partial pressure of water vapor on that side of each restriction or orifice which is toward the condenser. Since, according to the laws of adiabatic gaseous flow, reducing the pressure to less than 55 percent of the pressure on the condenser side of each orifice produces no further increment in rate of flow through the orifice, lowering of the temperature of the condenser beyond a certain point cannot compensate for small vapor lines or for other restrictions.

*At pressures below a micron, the mean free path of the molecules approaches the diameter of the pipe line and the laws of flow no longer govern. Movement of the vapor is then controlled by the natural diffusion of molecules. This condition is not reached in drying by sublimation.

Direct Pumping

Direct pumping of the water vapor by means of a steam ejector provides a simple procedure. If refrigeration is required for external prefreezing, however, a steam ejector and boiler are generally not as low in initial cost or operation as a refrigerated condenser. This economy is gained by proper balance of the refrigeration used in prefreezing with that required for chilling of the condenser. Where external prefreezing is not required and where the cost of steam and water is sufficiently low, ejectors often are preferred. The pressure requirements depend on the partial pressure of water vapor needed to dry the product in question. The same conditions of water vapor pressure must be established by the ejector as are established by low-temperature condensers. In the former case, the condensers control only the water-vapor pressure; in the latter instance, the steam ejectors are designed to handle both water vapor and air.

Degree of Vacuum

It is important to distinguish between the total pressure in the vacuum system and the partial pressure of water vapor in that system. This distinction oftentimes is not recognized. The leakage of air into the system, in relation to the size and efficiency of the vacuum pump, determines the partial pressure of the residual air. For low-temperature condensation, there is no need for the vacuum pump to do more than evacuate to a pressure below that corresponding to the temperature of the condenser. But the pump should have ample capacity and efficiency at that pressure to prevent the accumulation of noncondensible gas in the condenser. With any given condenser and degree of vacuum, the higher the partial pressure of air, the lower the condenser temperature must be to maintain the partial pressure of water vapor at an effective level. Since the pump must take some water vapor at that pressure, it is advantageous to have the vacuum pump equipped with some means for continuous clarification of the oil.[6]

In the case of direct pumping by steam ejector, the same pumping equipment takes care of both the water vapor and noncondensible gases. The last stages must have enough capacity to handle all the air that leaks into the system. And for proper design this must be

(*Turn to page* 168)

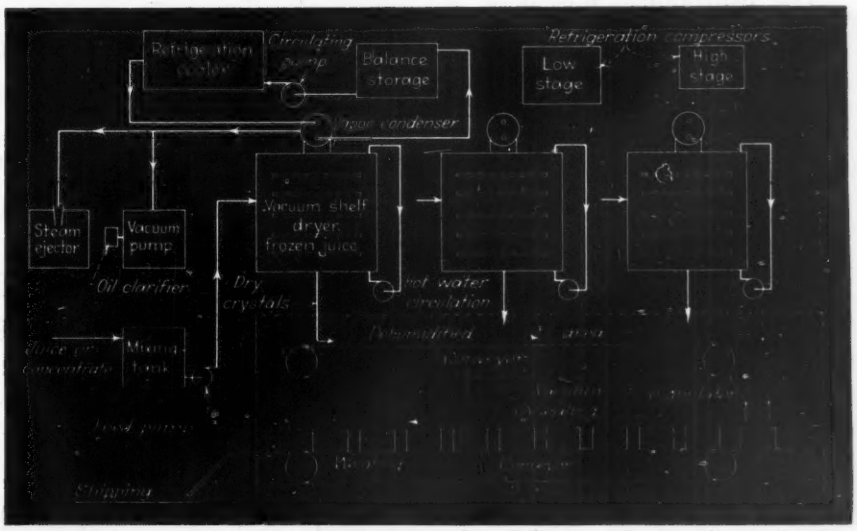


FIG. 3. Flow sheet for vacuum sublimation of orange juice. Three dryers, operated as batch units on a time cycle, permit practically continuous operation. The juice is deaerated and frozen by the application of vacuum, then maintained below the freezing point, still under high vacuum, while heat energy is supplied by hot water circulated through the jacket and hollow shelves. Water sublimed from the frozen juice is condensed, the temperature of the condensing surface being maintained by the refrigerating cooler. The vacuum pump or steam ejector, or both, remove noncondensible gases and air.

New Facts About Packaging And Storing Dehydrated Foods

By MEMBERS OF THE RESEARCH STAFF, Research Laboratories, Continental Can Co., Chicago, Ill.

Dehydrated hominy compares favorably in every way with ordinary hominy. Its color and flavor are well retained for more than a year, even at high temperatures, if the product is packed in an oxygen-free atmosphere

PART XII—DEHYDRATED HOMINY

DEHYDRATED hominy is an entirely acceptable food product when reconstituted, being comparable in every way to hominy as ordinarily purchased. When packaged in an atmosphere comparatively free from oxygen, it will retain almost all of its original color and flavor for more than 12 months, even at elevated temperatures.

Dehydrated hominy for this experimental pack was secured from the Vincennes Packing Co., Vincennes, Ind. White corn (Hickory King variety) was used in its preparation. It was ready for dehydrating when it had gone through the particular lyeing, bleaching and swelling processes used by this company.

The dehydrating was done in twin tunnels of the center-exhaust type as advocated by the Western Regional Laboratory of the Department of Agriculture. Each of the tunnels is divided into primary and secondary sections. Tray loads of about 1½ lb. per square foot were used, with the entering air temperature at 200 deg. F. in the primary sections and 145 deg. F. in the secondary sections. No data on the relative humidity of the air in the two sections were available because the recording instruments were not installed at the time this lot was dried. The drying time was approximately 7 hours. No equalizing or finishing bins were used.

As the hominy came out of the dehydrater it was inspected for defects and then packaged in enamel-lined 5-gal. square cans fitted with a $6\frac{3}{16}$-in. double-seamed closure. Four of the cans, filled with hominy dehydrated on June 2, 1943, were forwarded to our Chicago laboratories. It was repackaged as outlined in Part I (FOOD INDUSTRIES, March, 1944, p. 63) and stored under the proper conditions on June 7, 1943.

The following modifications of the regular examination procedure were made in the course of this experiment:

1. Vitamin analyses: It was assumed that the normal processing of corn in the preparation of hominy would destroy most of its vitamin values. However, a vitamin assay for carotene, ascorbic acid, thiamine and riboflavin was made at the initial examination. The results indicated that none of these vitamins was present in appreciable quantity.

2. Packaging: In addition to the four packages used for all of the other samples, an enamel-lined can was in-

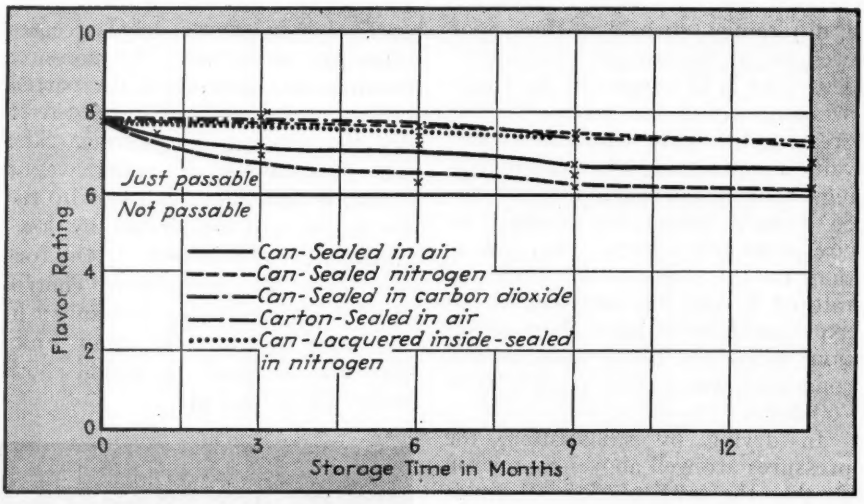


FIG. 1. Effect of storage time and temperature on flavor rating of dehydrated hominy stored at 75 to 80 deg. F.

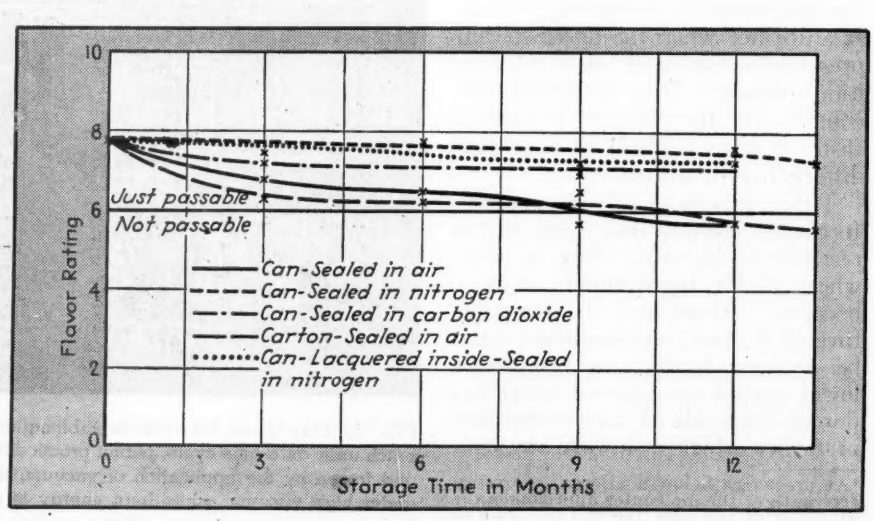


FIG. 2. Effect of storage time and temperature on flavor rating of dehydrated hominy stored at 98 deg. F.

cluded for the packaging. This package was added because it had been suggested that small specks of black discoloration might result wherever the product came into contact with the tinplate. This enamel-lined can was sealed in an atmosphere of nitrogen.

3. Reconstitution: All the flavor tests and drained weights were made on samples prepared according to the following formula: 10 grams of dehydrated hominy soaked in 75 c.c. of 1 percent salt solution for 1 hour, then brought to a boil and simmered for 30 minutes.

Summary of Results

Effect of Packaging—The gas-packed hominy was definitely superior to that packed in air with respect to flavor. This superiority was especially noticeable in the samples stored at elevated temperatures. No appreciable difference was found in flavor retention between the samples packed in nitrogen and those packed in CO_2. No difference was noted between the product in the air-packed can and that in the carton. There were no appreciable color differences in the samples packed by the various methods. After one year of storage at 98 deg. F. and 93 percent relative humidity, there was only slight absorption of moisture by the sample in the paper packages.

Discoloration resulting from contact with metal in the plain cans did not occur. There was a slight tendency for black specks to appear when the product was shaken in

TABLE I — Results of Examinations of Dehydrated Hominy Stored at 75 to 80 Deg. F. (Room Temperature).

Storage time	Package moisture	Flavor rating	Drained weight (grams)	Color (dry product) % N.1 (black)	% 5YR 6/12 (orange)	% 5Y 9/14 (yellow)	% N9.5 (white)	Gas analyses $\%O_2$	$\%CO_2$
			Moisture content = 5.0 percent						
Initial examination	Can—air	..	..	..	..	..	..	..	..
	Can—N_2	7.8	31	46	19	13	22	0.2	0.0
	Can—N_2 Rel[1]	7.8	33	46	19	13	22	0.3	0.0
	Can—CO_2	7.8	31	46	19	13	22	0.4	98.2
	Carton	..	..	..	..	..	..	..	..
1 month	Can—air	7.5	39	42	14	21	23	..	..
	Can—N_2	7.5	38	42	14	21	23	..	..
	Can—N_2 Rel[1]	7.5	40	44	12	19	25	..	..
	Can—CO_2	7.5	37	40	18	19	23	..	..
	Carton	7.5	37	48	12	21	19	..	..
3 months	Can—air	7.0	32	41	15	17	27	13.6	0.2
	Can—N_2*	7.9	35	39	12	24	25	0.0	0.0
	Can—N_2 Rel*[1]	8.0	34	40	13	19	28	0.0	0.0
	Can—CO_2	8.0	34	37	19	21	22	0.2	98.0
	Carton	7.2	31	40	17	20	23	..	..
6 months	Can—air	7.3	35	40	16	17	27	11.6	0.2
	Can—N_2*	7.7	36	37	17	20	26	0.2	0.1
	Can—N_2 Rel*[1]	7.5	34	39	20	17	24	0.0	0.0
	Can—CO_2	7.7	35	37	16	20	27	0.3	98.3
	Carton	6.3	35	40	18	19	23	..	..
9 months	Can—air	6.5	36	32	12	24	32	8.5	0.4
	Can—N_2	7.5	37	30	9	30	31	0.0	0.0
	Can—N_2 Rel[1]	7.5	36	43	12	22	23	0.0	0.0
	Can—CO_2	6.7	37	35	11	25	29	1.6	96.9
	Carton	6.2	38	35	11	25	29	..	..
12 months	Can—air	..	35	40	12	30	18	6.4	0.8
	Can—N_2	..	37	40	11	27	22	0.0	0.0
	Can—N_2 Rel[1]	..	36	40	11	27	22	0.0	0.0
	Can—CO_2	..	36	40	14	28	18	2.5	94 8
	Carton	..	37	40	11	27	22	..	..
16 months	Can-air	6.8	..	..	..	..	..	..	..
	Can-N_2	7.2	..	..	..	..	..	..	..
	Can-CO_2	7.3	..	..	..	..	..	..	..
	Carton	6.1	..	..	..	..	..	..	..

[1]Enamel lined.
*Both the plain and enamel-lined cans were shaken vigorously before opening to reproduce the abrasive action against the sides of the can that would occur under average shipping conditions. Visual inspection verified the lack of any difference in the amount of black discoloration in these samples as shown by the color data.

TABLE II — Results of Examinations of Dehydrated Hominy Stored at 98 Deg. F.

Storage time	Package moisture	Flavor rating	Drained weight (grams)	Color (dry product) % N.1 (black)	% 5YR 6/12 (orange)	% 5Y 9/14 (yellow)	% N9.5 (white)	Gas analyses $\%O_2$	$\%CO_2$
			Moisture content = 5.0 percent						
Initial examination	Can—air	..	..	..	..	..	..	..	..
	Can—N_2	7.8	31	46	19	13	22	0.2	0.0
	Can—N_2 Rel[1]	7.8	33	46	19	13	22	0.3	0.0
	Can—CO_2	7.8	31	46	19	13	22	0.4	98.2
	Carton	..	..	..	..	..	..	..	..
1 month	Can—air	7.5	37	46	11	21	22	17.8	0.3
	Can—N_2	7.5	38	44	10	25	21	0.1	0.2
	Can—N_2 Rel[1]	7.5	38	44	10	25	21	0.3	0.2
	Can—CO_2	7.5	38	49	15	20	16	0.2	98.5
	Carton	7.5	39	41	10	22	27	..	..
3 months	Can—air	6.8	..	39	17	20	24	10.8	0.2
	Can—N_2	7.5	..	38	15	21	26	0.0	0.2
	Can—N_2 Rel[1]	7.7	..	38	15	21	26	..	..
	Can—CO_2	7.2	..	39	14	21	26	1.4	96.6
	Carton	6.3	..	47	15	18	20	..	..
6 months	Can—air	6.5	35	43	19	13	25	1.6	0.6
	Can—N_2	7.8	36	42	20	13	25	0.0	0.1
	Can—N_2 Rel[1]	7.4	35	42	18	15	25	0.0	0.0
	Can—CO_2	7.1	36	43	16	16	25	0.3	97.5
	Carton	6.3	35	47	21	16	16	..	..
9 months	Can—air	5.7	35	55	5	15	25	0.4	1.7
	Can—N_2	7.2	37	55	6	20	19	0.0	0.0
	Can—N_2 Rel[1]	7.0	36	55	6	18	21	0.1	0.0
	Can—CO_2	7.0	36	56	6	19	19	1.6	96.6
	Carton	6.5	35	58	6	18	18	..	..
12 months	Can—air	5.8	35	40	13	28	19	0.3	1.9
	Can—N_2	7.5	36	40	10	28	22	0.0	0.0
	Can—N_2 Rel[1]	7.3	36	40	10	28	22	0.0	0.0
	Can—CO_2	7.6	36	40	10	31	19	2.8	95.4
	Carton	..	36	40	12	26	22	..	..
16 months	Can—N_2	7.2	..	..	..	..	..	..	..
	Carton	5.6	..	..	..	..	..	..	..

[1]Enamel lined.

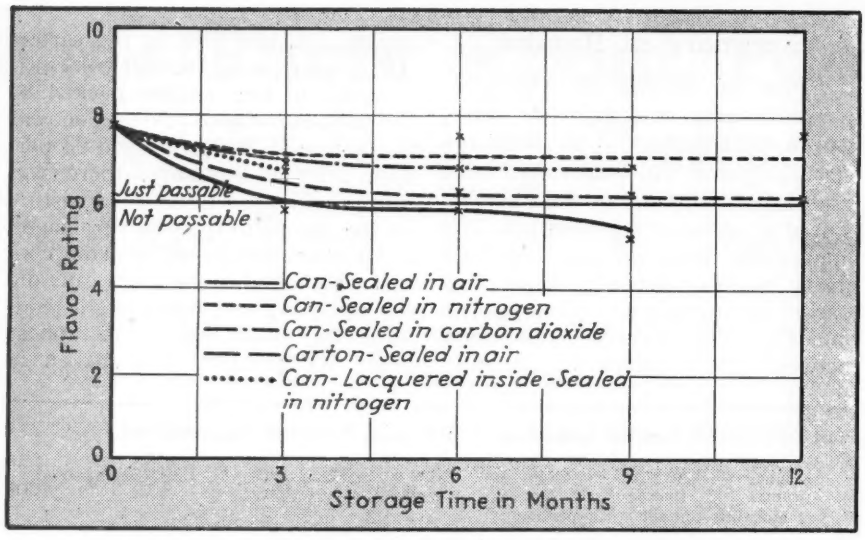


FIG. 3. Effect of storage time and temperature on flavor rating of dehydrated product stored at 130 deg. F.

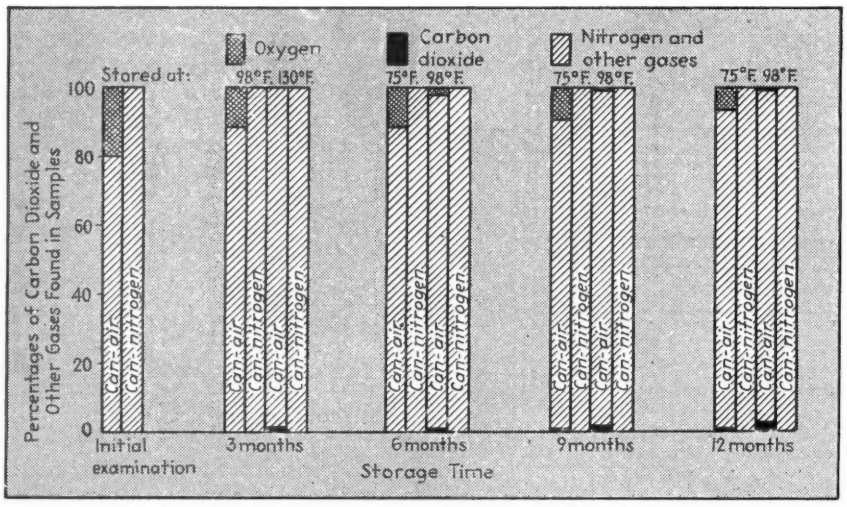


FIG. 4. Effect of storage time and temperature on evolution of CO_2 by dehydrated hominy packed in air and in nitrogen.

both the plain and the enameled cans.

Effect of Storage Time and Temperature — Dehydrated hominy is quite stable during storage. There

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TABLE IV—Results of Periodic Weighings of Dehydrated Hominy Packed in Cartons Stored at 98 Deg. F. and 93 Percent Relative Humidity.

Storage time	Number of samples weighed	Average percent increase in product weight over original*
Initial examination	20	..
1 month	20	0.30
3 months	18	0.51
6 months	17	0.89
9 months	15	1.32
12 months	12	1.74

*These figures are corrected for the weight of water absorbed by the paper in the container (4 percent increase in container weight in 5 days).

TABLE V—Results of Periodic Moisture Determinations on Dehydrated Hominy.

Storage time	Storage temperature (deg. F.)	Package	Moisture content (percent of total weight)
Initial examination	..	..	5.0
1 month	98	Carton*	4.8
3 months	98	Carton*	4.1
6 months	98	Can—air	4.5
6 months	98	Can—N_2	4.5
6 months	98	Carton*	4.3
6 months	75-80	Can—air	5.0
6 months	75-80	Can—N_2	4.1
6 months	75-80	Carton	4.8
9 months	98	Can-air	5.3
9 months	98	Can—N_2	5.0
9 months	98	Carton	6.3
9 months	75-80	Can—air	5.0
9 months	75-80	Can—N_2	4.4
9 months	75-80	Carton	5.1
12 months	98	Can—air	5.0
12 months	98	Can—N_2	4.7
12 months	98	Carton	5.0
12 months	75-80	Can—air	5.2
12 months	75-80	Can—N_2	4.2
12 months	75-80	Carton	4.7

*The paper packages stored at 98 deg. F. were also subjected to a relative humidity of 93 percent.

TABLE III—Results of Examinations of Dehydrated Hominy at 130 Deg. F.

Storage time	Package moisture	Flavor rating	Drained weight (grams)	Color (dry product) % N.1 (black)	% 5YR 6/12 (orange)	% 5Y 9/14 (yellow)	% N9.5 (white)	Gas analyses $\%O_2$	$\%CO_2$
			Moisture content = 5.0 percent						
Initial examination	Can—air	..	..	..	..	..	..	..	..
	Can—N_2	7.8	31	46	19	13	22	0.2	0.0
	Can—N_2 Rel[1]	7.8	33	46	19	13	22	0.3	0.0
	Can—CO_2	7.8	31	46	19	13	22	0.4	98.2
	Carton	..	..	..	..	..	..	..	..
1 month	Can—air	7.5	30	41	14	21	24	6.1	1.1
	Can—N_2	7.5	36	47	14	15	24	0.2	0.1
	Can—N_2 Rel[1]	7.5	37	46	10	20	24	0.3	0.1
	Can—CO_2	7.5	36	46	10	20	24	0.2	99.2
	Carton	7.5	35	47	12	20	21	..	..
3 months	Can—air	5.9	32	45	16	21	18	0.0	1.6
	Can—N_2	6.9	35	39	16	21	24	0.0	0.0
	Can—N_2 Rel[1]	6.8	34	41	16	21	22	0.0	0.4
	Can—CO_2	7.0	33	42	19	17	22	0.0	99.3
	Carton	5.9	33	41	18	21	20	..	..
6 months	Can—air	5.9	34	51	14	18	17	0.5	0.9
	Can—N_2	7.6	36	50	14	17	19	0.0	0.0
	Can—N_2 Rel[1]	..	..	..	..	..	..	..	..
	Can—CO_2	6.8	34	50	14	17	19	..	..
	Carton	6.3	34	56	15	18	11	..	..
9 months	Can—air	5.2	36	..	..	..	..	..	..
	Can—N_2	..	..	..	..	..	..	..	..
	Can—N_2 Rel[1]	..	..	..	..	..	..	..	..
	Can—CO_2	6.8	38	..	..	..	..	1.4	97.5
	Carton	6.2	37	..	..	..	..	..	..
12 months	Can—air	..	..	..	..	..	..	..	..
	Can—N_2	7.6	37	40	12	27	21	0.0	0.2
	Can—N_2 Rel[1]	..	..	..	..	..	..	..	..
	Can—CO_2	..	..	..	..	..	..	..	..
	Carton	6.1	36	42	12	29	17	..	..
16 months	Carton	..	..	43	15	28	14	..	..

[1]Enamel lined.

Cooperative Research Solves Army Egg-Drying Problems

By E. S. STATELER, Associate Editor, "Food Industries," Chicago, Ill.

QMC specification of not more than 2 percent moisture for whole-egg powder resulted in a mobilization of research facilities and talent whose resourcefulness had never before been called upon, much less evaluated

PRESSURE of war needs has brought about many changes from the peacetime way of processing many foods. Whether or not the new products made or the new procedures used can be utilized during the postwar period yet remains to be determined. Much depends upon the then existing economic and marketing conditions, upon the working, living and eating habits of both the civilians and the mustered-out members of the armed forces, and upon the forward-looking viewpoint of manufacturers and processors.

During this war period, however, lessons have been learned; old prejudices or inhibitions have been broken down; and effective cooperative work has been done. All of these progressive wartime gains will pay substantial dividends, if applied to postwar problems.

An example of what can be done cooperatively to overcome a most perplexing problem in a relatively short time is found in the production of dried whole-egg powder with not more than 2 percent moisture content.

Research Gets Results

In calling a third conference on egg-drying for the armed forces at Omaha, Neb., last October, the Quartermaster Subsistence Research and Development Laboratories indirectly heralded the success of a hereto-fore untried program of intensive, and at the same time extensive, cooperative and coordinated research. Stripped of its diplomacy, the conference was called to tell holders of QMC dried-egg contracts that highly satisfactory whole-egg powder for the Army could be, and was being, made and that the properties specified in QMC contracts are to be met during 1945.

The announcements were no surprise to most of the invited representatives of egg-drying companies holding 1944 QMC contracts. They in fact epitomized attainment of objectives projected during two earlier meetings. These conferences had been held to launch and to report on an extensive research program to determine what makes whole-egg powder unstable, how stable egg powder might be made on an industrial scale, and what protection should be given it during shipping and storing for a period of a year or more.

That research program was cooperatively participated in by the companies and organizations listed in Table I.

The program was under the guidance of Dr. George F. Stewart of Iowa State College and Capt. George Gelman of QMC Subsistence Research and Development Laboratories. Dr. Stewart functioned as coordinator between cooperating state colleges, agricultural experiment stations and industry research laboratories. Captain Gelman functioned as liaison officer between the egg-drying industry and QMC in determining the requirements of the armed forces and drawing up specifications for the egg powder that would meet those requirements. The results of the program as announced show conclusively that whole-egg powder can be made to conform to the rigid QMC specifications soon to be announced for 1945.

War Forces Progress

These specifications have had an evolutionary development which has been speeded up by the research program, as has the egg-drying technology by which they can be met.

Upon the outbreak of the present war, QMC purchases of whole-egg powder were on the basis of Federal specifications which set the moisture content at 8 percent and other properties as would be obtained from drying market shell eggs. By the summer of 1942, the QMC had ample evidence from the Southern and Southwestern Pacific war zones, from surveys of QMC inventory and from its laboratory and field-feeding tests to prove that whole-egg powder containing 5 percent moisture does not have sufficient stability under tropical conditions to be a palatable food for human consumption. In fact, laboratory studies showed that it becomes unpalatable after 2 weeks at 100 deg. F., after 6 months at room temperature and after 1 year at 50 deg. F.

Since 9 to 12 months are required to get U. S. A.-produced foods through the supply pipe line to the Pacific battle areas, QMC found itself faced with the alternative of either taking dried whole eggs out of the armed forces' subsistence or finding out how whole-egg powder

Application of improved raw-material selection, of preheating, of multiple-stage drying, of closed-system cooling and of gas-packing gave rebirth to large-scale production of dried whole eggs for use by the armed forces in tropical and near tropical war zones. Procedures followed are likely to find application for postwar drying of whole eggs, fruit juices, ice cream mixes, nonfat and whole milks, vegetable purees and soups.

of much higher stability could be made. QMC investigations indicated as early as about April 1, 1943, that there was need for a much different quality whole-egg powder than had yet been made, if it was to be continued as an item of subsistence.

Before this conclusion was reached, progress had been made to improve the quality of the 5 percent moisture powder. This progress resulted from trial-and-error work done by the production departments of the egg-drying companies at the suggestion of their research departments working in a liaison relation to the QMC. But, the research work needed coordination, and the liaison relationship needed expansion to include other research groups working on the same or kindred problems. At this stage much emphasis was being placed on palatability tests.

Results of recent studies at QMC laboratories show that palatability tests give misleading results unless the tests are carried out in a scientific manner. That provision means that the conditions must be controlled with respect to selection and preparation of samples, that selected environmental conditions should be observed, and that the judges participating in the tests should be discriminatingly selected, calibrated for sensitivity and accuracy of taste, and trained to do palatability tests on dried eggs. Also, the interpretation of the palatability tests were misleading. There was an insufficient amount of background information on the samples and on the fundamental reasons for the results obtained.

As a result, the situation in the egg-drying industry had become so confused that there did not seem to be any future for powdered whole eggs as far as the Army was concerned, although the demand from England and other north-temperate zone areas was for more and more dried whole eggs.

TABLE I—Participants in Egg Powder Research Program.

1. Agricultural Research Administration
   a. Beltsville Research Center
   b. Eastern Regional Research Laboratories
   c. Western Regional Research Laboratories
2. National Egg Products Association
   a. Illinois Institute of Technology
   b. Iowa State College
   c. Kansas State College
   d. Purdue University
   e. University of Nebraska Medical School
3. U. S Army
   a. Q.M.C. Subsistance Research and Development Laboratory, Chicago, Ill.
   b. Seventh Service Command Laboratory, Ft. Omaha, Neb.
4. Industry Collaborators
   a. American Can Co.
   b. Armour & Co.
   c. Borden Co.
   d. Container Corp. of America
   e. Continental Can Co.
   f. Fairmont Creamery Co.
   g. Food Machinery Co.
   h. Gordon Johnson Co.
   i. Henningsen-Denison Co.
   j. Jerpe Commission Co.
   k. Rogers Co., C. E.
   l. Seymour Packing Co.
   m. Swift & Co.
5. Canadian National Research Council, Ottawa.
6. Low Temperature Research Station, Cambridge, England

The difficulties were not confined alone to the making and shipping of the eggs. Field reports showed that even when dried eggs of good quality were provided to the Army cooks, they too frequently were misused, improperly reconstituted and poorly cooked. That meant that there was also the problem of acquainting Army cooks with the virtues and advantages of good powdered eggs so that they would try to make intelligent use of the eggs if or when available.

The Industry Acts

Rather than give up powdered whole eggs as an Army subsistence item, an egg-processing conference was called in June, 1943, by the Technical Committee of the National Egg Producers' Association. Out of this conference came the realization of the need for a scientific study of eggs as well as the determination of ways and means of drying eggs to get a relatively stable and acceptably palatable powder.

Instead of launching or sponsoring a new research project, decision was made to use all available existing research facilities and to correlate existing information. This approach promised the quickest and, very probably, the best results.

Negotiations were started with the National Egg Products Association, the National Coordinated Poultry Products Research Committee, Canadian National Research Council at Ottawa and the Low Temperature Research Station at Cambridge, England. Common interest in a common wartime problem brought prompt responses. Within a few weeks a fully organized and coordinated research and production program was under way.

Through joint relations with the National Coordinated Poultry Products Research Committee, access was had to the work done for the Agricultural Research Administration. The Beltsville (Md.) Research Center had specialized on egg-processing methods. Eastern Regional Research Laboratories, working under the auspices of W. D. Termohlen, Assistant Chief of the Dairy & Poultry Branch, Office of Distribution, was doing work on the microbiology of eggs for the War Food Administration. The Western Regional Research Laboratories focused on the chemistry of eggs. It marshalled all-out effort to supply fundamental research data upon which the 1945 QMC egg program will be based, particularly that on the deteriorating changes taking place during storage.

Correlated with the information received from these fundamental research organizations was the data of the research program of the egg-drying industry, sponsored by National Egg Processors Association and directed by Dr. George F. Stewart.

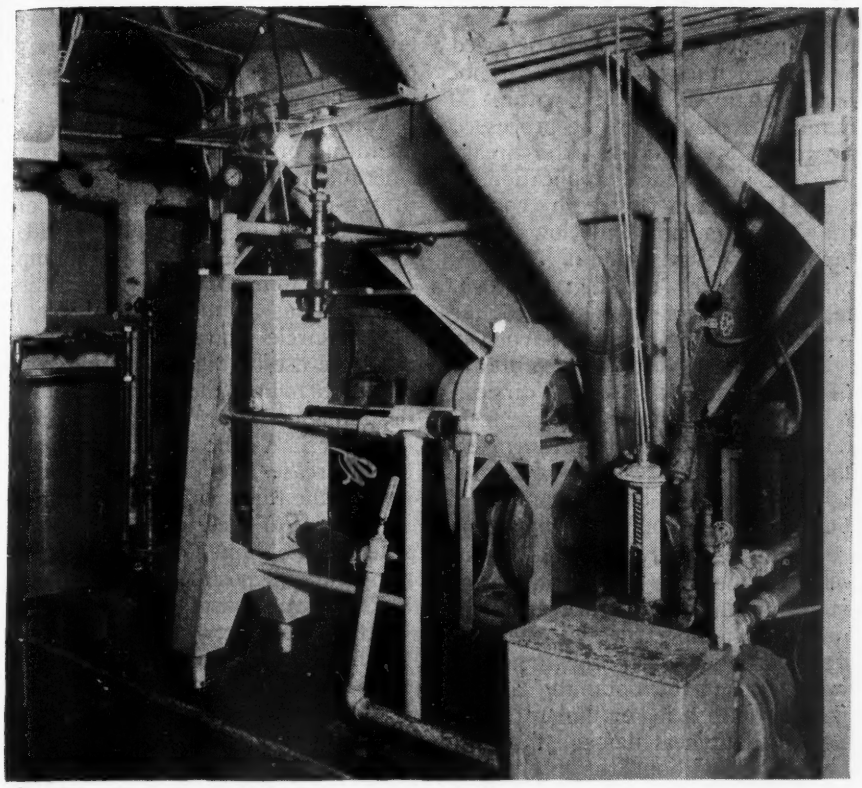
From the start of the program, its objective was to determine factors in the selection, handling and processing of eggs that affect the eating qualities and the storage life of whole-egg powder, including cooking, packaging and storing of the powder. Results were wanted in the shortest possible time. For that reason all experimental efforts were focused upon the determination of those fundamental factors. As their part in the National Egg Products Association coordinated program, participating egg-drying companies practically turned the production

TABLE II—Plate Count Comparison of Bacterial Content of 1 c.c. of Egg-meats of Various Grades of Eggs.*[1]

Grade of Egg	Dilution 1-1,000	Dilution 1-10,000	Average count	B. coli count
Machine washed				
Yolks	34,000	40,000	36,000	.....
Whites	7,000	40,000	23,500	.....
"Clean"				
Yolks	143,000	110,000	126,500	34,000
Whites	80,000	150,000	115,000	20,000
Hand washed				
Yolk	540,000	750,000	645,000	78,000
Whites	110,000	240,000	175,000	48,000
Unwashed				
Yolk	1,230,000	1,760,000	1,495,000	114,000
Whites	216,000	460,000	338,000	57,000

*Average bacteria on a dirty egg is 181,000,000,000. Egg merely washed has 800 bacteria on the shell. Spray-washed eggs rotated under ultraviolet have 20 bacteria on the shell.

1M. F. Gunderson, University of Nebraska Medical School study for the National Egg Products Association.



Part of the egg drying installation in Armour's Ft. Worth, Tex., plant. Plate preheater is shown at left. Closed connection between primary dryer and redryer may be seen (pipe extending upward).

facilities of their plants over to the QMC officers. With such facilities at its disposal, the QMC was able to make experimental runs on a commercial scale to determine the limitations of the variables under study and to obtain data which could be interpreted into production performance. Samples with full history were taken from these runs and sent to all coordinating laboratories for study and quality evaluation.

Results of these studies showed the bacterial content of the powder to be an indicator of the quality of eggs broken for drying and of how they had been handled between breaking and drying. Contrary to what might be expected, there were exceptions in which current-receipt eggs were heavily cultured with *Ps. florescens.* They also showed that eggs dried to a moisture content of 2 percent retained their good qualities at room temperature for a year or more; that the powder should be cooled to 80 deg. F. or lower before packaging; and that it should be kept under a hermetic, oxygen-free seal, preferably under CO_2.

Plant Studies Made

As the research program progressed, these experimental findings were supplemented by plant production studies to determine what practices should be followed to hold the bacterial content of the liquid eggs and egg powder to a minimum to avoid the possibility of pathogenic bacteria being carried by egg powder, to obtain powder containing not more than 2 percent moisture, to continuously and protectively cool the powder before packaging and to prevent deterioration of the powder after packaging.

The findings of the experimental plant studies were made available to all holders of QMC contracts and put into practice as rapidly as plant changes could be made. Use problems were minimized by the giving of special instructions and training on how to use dried eggs to student cooks attending QMC bakers' and cooks' schools, by formulating and compiling into pamphlet form recipes using powdered eggs, and by requiring inclusion of two copies of these pamphlets in each shipping case containing canned egg-powder to be sent into war zones.

To encourage adoption of improved methods and practices resulting from the research program by holders of QMC contracts, the research program was supported by a revision of the QMC procurement program to remove uncertainties that existed prior to 1944. Under the original program, procurement was made on quarterly contracts after bids had been asked on stated quantities of egg powder. As a start toward conversion from a quarterly to a much longer period of procurement, 50 egg-drying plants were inspected during late 1943 and early in 1944 under the immediate direction of Clair R. Bishop, Principal Procurement Specialist for dried eggs. From these 50 plants, 18 plants belonging to 9 companies were selected and given contracts for a 12-month period so that production could be planned for the full year and so that plant changes with installation of necessary equipment and facilities for the production of QMC egg powder could be justified.

All problems connected with the drying of whole eggs had not been fully solved by the time the Omaha Conference was called, and the details of the specifications for 1945 production had not been worked out. But sufficient progress had been made to warrant gearing the industry to a volume production of whole-egg powder of 2 percent or lower moisture content which would reach the battle areas in the tropics in a fresh-egg condition of palatability. To that end, Col. R. A. Isker, as Director of the QMC Subsistence Research and Development Laboratory, invited to the Conference representatives of the companies and organizations participating in the research program. Holders of 1944 QMC contracts were included for an interchange of information and experiences which had been obtained, as well as to be preliminarily informed on the likely requirements to be met for 1945 QMC contracts.

In the absence of Colonel Isker, Captain Gelman presided and summarized the findings of the research program in terms of a dried whole-egg powder which complied with QMC specifications, which met with favorable acceptance by soldiers in the field, and which retained its initial good eating quality.

As the conference progressed, emphasis was put on the ways and means of obtaining the improvement in the flavor and stability of the egg powder. They were: (1) Use of higher quality eggs than had previously been the practice; (2) more effective use of refrigeration; (3) heat-treating or pasteurization of the eggs before drying; (4) multistage drying of the eggs; (5) quick cooling of the powder in a closed system, and (6) gas-packing in CO_2 under hermetic seal.

Improvement in quality of eggs consists of using only current-receipt

eggs or frozen eggs from a backlog built up from current receipts during the flush egg-producing season. Whether the current receipts were for immediate drying or for freezing for a backlog, all shell eggs held for more than three weeks after being received in the plant, and all "checks," "leakers" and "mud-balls" were rejected along with the candling rejects and those discarded by the breakers as being musty or having an "off-odor." The accepted eggs have to be broken out on the day they are received or are stored in coolers having an air temperature not to exceed 40 deg. F. Bacteriological tests showed that sound "dirties" are acceptable if mechanically washed in fresh-water sprays at a temperature of not less than 150 deg. F., given an effective germicidal treatment such as exposure to ultraviolet rays, dried before candling and promptly broken out (see Table II). These practices result in a reduction in total bacteria content of the eggs, with an accompanying improvement in flavor and stability of the powder during shipment and storage. Further precautions specified to keep bacterial content to the minimum are that the sound shell eggs shall be handled on conveyors, in buckets or in baskets to avoid unnecessary breakage, that sweating be kept to a minimum during handling of the eggs from cooling rooms to the breakers, and that the egg-meats be so handled as to avoid contamination after being broken out.

Cooling and Preheating

Effective use of refrigeration is defined in terms of adjusting the egg-meats to not higher than 45 deg. F. within 30 minutes after breaking out if they are to be dried or frozen within two hours or to not higher than 40 deg. F. within 30 minutes if they are to be processed between 2 to 20 hours after breaking out. Mechanical application of the refrigeration may be by cooling the shell eggs sufficiently low before breaking which generally is not practicable, by running the egg-meats through a dairy-type cooling coil or by cooling in a dairy-type vat.

Heat-treating of the egg-meats, like mechanical washing of "dirties," is a definite contribution of the technology of egg-drying resulting from the coordinated research program. Its adoption has been accompanied by technical and operating problems.

During the early stages of the research program, heat-treating was merely preheating before drying to raise the temperature of the eggs before they reached the dryer. It was a means of obtaining an egg powder with a lower moisture content without heat damage than was obtainable without the preheating. Microbiological studies of egg-meats and determination of temperatures to which the eggs might be heat-treated showed that the preheating could be successfully carried out at what appears to be pasteurizing levels, both to obtain low-moisture powder and to minimize any potential public health hazard.

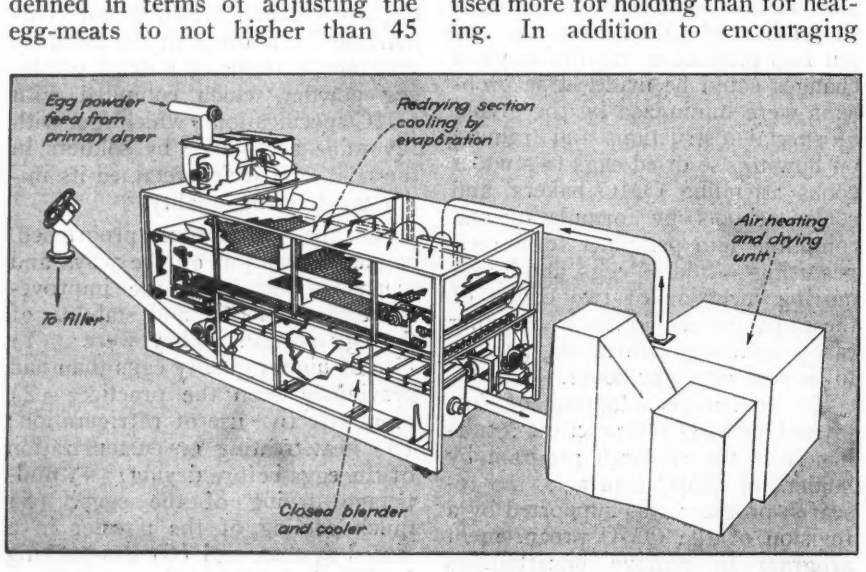
Types of preheaters used included: (1) Tubular, (2) vat, (3) plate, and (4) cylindrical with an inner-wall scraping agitator. Of these, the plate and the cylindrical types give satisfactory results. The tubular and vat types are now being used more for holding than for heating. In addition to encouraging channeling, tubular heaters fail to give a satisfactory transfer of applied heat when used to preheat egg-meats.

With the plate heaters, there is an operating problem which gives considerable trouble in the heat-treating of egg-meats. It is film build-up on the surfaces of the heating plates and in the high-pressure pump. Since the film from the start of its build-up has an insulating effect, a vicious circle is created. It necessitates the use of higher heating temperatures to keep the egg-meats at the desired temperature for delivery into the dryer. As the applied temperature increases, the rate of film build-up and the thickness of the film also increase. For these reasons, best results were obtained when the lowest temperatures possible were used on a compromise basis to have the egg-meats in contact with the heating surfaces for the shortest time possible. This compromise was reported obtainable by heating during a continuous flow of the egg-meats; by holding the eggs in the heating zone with continuous agitation; and by heating during continuous flow followed by a holding period. Introduction of a bypass to permit recirculation of 50 percent of the eggs through the heater aided in deterring film build-up. Removal of all solids such as bits of egg shells, chalazae and pieces of egg skin before reaching the heater was cited as imperative to deter film build-up. Elimination of these solids by use of screens instead of by centrifuge was recommended because the specific gravity of the egg-meats is intermediate to the specific gravities of the chalazae and bits of shell.

Avoidance of film build-up has both a physical and a bacteriological significance apart from its insulating effect. When the film builds to a significant thickness, lumps are likely to loosen and later clog up the pipe lines to the dryer or the spray nozzles in the dryer. Also, films are bacteriological menaces in that they encourage the growth and multiplication of thermoduric bacteria, sometimes in the "hot" area of the heater, and serve as a seeding or infecting culture for the egg-meats that pass.

Even though the plate-type heaters are being used successfully to flash-heat egg-meats to at least 140 deg. F., their use involves other precautionary practices. Pumps geared to supply egg-meats to the heater only at the rate of dryer operation cause foam to form in the upper portions of the plates, especially if

(*Turn to page* 160)


Egg powder feed from primary dryer
Redrying section cooling by evaporation
Air heating and drying unit
To filler
Closed blender and cooler

Sketch of redryer designed and built by Food Machinery Corp. and installed in the Armour & Co. plant at Dennison, Iowa. A redryer known as the Conrad type is installed in Armour's Ft. Worth, Tex., plant.

EDITORIALS

LAURENCE V. BURTON, Editor

What Does the U. S. Want

THE time is soon coming when a lot of us are due for a series of disappointments, all because we have not at this time formulated any definite statements of our wants in the postwar world. Americans are in the habit of neglecting any intensive thought about international desires or aspirations or about what arrangements — definite arrangements —we should like to see made in the world as soon as the fighting is over. Then when some other nation pops up with something in its possession, that in retrospect we are sure should have been disposed of otherwise, we get sore about it. We even rail at the aggressiveness of other nations when, as a matter of fact, the fault is entirely our own.

Consider Russia. If ever there was a nation that knows exactly what it wants, it is Russia. It has a plan. It goes after its objective—and generally gets it.

Great Britain never assembled the British Empire without a plan and an objective.

Men who know both countries well state that if the United States has any marked desires, and presents them forcefully at the Allied Conferences, we usually get what we want. But generally we have no such objectives. So we get little. In fact, we apparently want nothing.

If it is true that we want nothing, then we should not take it amiss if the rest of the world wants something and gets it. This is not a plea for dreams of Empire. But it is a plea for Americans to think internationally, and not be all wrapped up in our own petty affairs.

Do we want the islands of the Pacific that we have taken away from Japan? If so, why? And what are we going to do with them? What would you do with them if they belonged to the United States?

If the answer is that you don't want them, and can't think of any possible use for them, then do not be annoyed if some other nation claims them, occupies them, exploits them and makes profit from its effort.

One of our great weaknesses in the foregoing type of question is that we are ignorant of these far away places. We do not travel enough, and too often when we do travel our people are on a holiday, out for a good time, and pay no attention to anything else. Lacking adequate knowledge, it is impossible to formulate any sort of a plan of sufficient merit for the government to support.

The day of international thinking is fast approaching, but it is doubtful if enough Americans will be ready with knowledge, plans, or even hopes, to be a real stimulant to members of Congress. After all, Congressmen are mostly ordinary chaps who will not do very much unless we prod them.

Germany's Food Losses

SOME measure of the German food situation may be gained by a study of calculations made by UNRRA. A recent address by Roy F. Hendrickson, deputy director of UNRRA, contains some very significant figures which, it is to be hoped, are correct.

". . . . Allied advances during the past summer have cost Germany upwards of 300 to 400 calories in daily per capita food supplies. The effect may not be immediate if Germany succeeded in setting up reserves of plundered food, and it is probable that in the case of grain this was done. But it is apparent that Germany's diet is fast moving towards an allowance of 1,600 to 1,700 calories daily, or around one-half U. S. average per capita consumption, and substantially below the prewar German level."

He estimates that Germany's net imports of food for the year ended March, 1944, were about 10,000,000 tons. The net loss of imports as a result of Allied advances is estimated to be about 7,000,000 tons.

Perhaps Germany will be starved out after all.

National Roster—Again

AN advisory committee to the National Roster of Scientific and Specialized Personnel was announced on November 5 by Paul V. McNutt, chairman, War Man Power Commission. It still includes the former director of the Roster, Dr. Leonard Carmichael, psychologist and president of Tufts College, with whom this department has been in controversy in recent years, all because his previous effort had omitted all consideration of the profession of Food Technology.

Our peeve has been caused, not by his failure to recognize the existence of food technology, but because the staff of his Roster outfit has written up repeatedly to aid in the location of men whose specified qualifications were those of food technology.

It is to be hoped that the new advisory board will instill a sense of realities into the revised roster.

Powder-Handling Technology

WITH the vast experience of flour millers, it would appear that every sort of problem of powder handling in the food field should have been solved long ago. But flour millers seldom have any occasion to change the temperature of their flours in a manner comparable to the needs of other branches of the food industry.

Below are listed a few of the sorts of food powders that present problems of temperature control:

Powdered Sugar—A chewing gum plant once chuted powdered sugar from an upper to a lower floor through a galvanized iron pipe *outside* the building. In very cold weather the powder became cooled so much that it condensed moisture from the air in the lower floor and became lumpy.

Cocoa Powder—Here is a powder that has a tendency to cake if it is allowed to pile up at temperatures near or above the melting point of the cocoa butter. Yet, when the press cake is pulverized, there is bound to occur a certain temperature rise as a result of the work done in grinding.

Spray-dried Milk and Egg Powders—Both of these powders are warm when they come from the dryers. Quality is impaired if the temperature of the powders is not reduced promptly. Egg powder presents a special problem because of its extreme hygroscopicity.

Powdered coffee extract, called "soluble coffee," dried yeast and dried molasses offer comparable problems.

These heat-transfer problems are not ones that can be neglected. A

pile of finely ground powdered material does not cool readily, so in some cases caking results and in others the quality deteriorates.

The engineering of such heat-transfer problems does not seem to be well worked out. It deserves considerable study.

New Market For Dehydrated Fruit

DESPITE the lugubrious predictions of certain persons regarding the future of dehydration, a new use has appeared for dehydrated (1 percent) apple crisps or nuggets. Quartermaster Corps Tentative Specifications for Pork and Apple Sauce, C.Q.D. No. 312, calls for 9 lb. of nuggets with each 100 lb. of fresh pork; also 2 lb. of corn starch. The whole batch, consisting of other ingredients as well, is mixed, packed into cans and sterilized.

Heretofore canned pork has always been braised or otherwise precooked before canning and sterilizing. That makes two heat treatments. In the new product, the raw meat is packed and gets only the single sterilizing cook. The older method was regarded as necessary because it was the only way to get rid of excess fluid cooked out of the meat. In the new way the fluid is soaked up by the nuggets, at the same time making apple sauce.

Whether this will be a peacetime product remains to be seen, but it suggests a possible new way to improve older products by avoiding double cooking.

Limitations of D.D.T. For Pest Control

D.D.T., the famous new "lousycide," which was also used so effectively to abort the spread of a typhus epidemic in Naples, will not prove to become a general pest-control panacea. Recent experiments, conducted by Prof. R. L. Webster (entomologist, Washington State College, Pullman, Wash.) indicate the chemical provides excellent control of the codling moth, but it had no effect upon the Pacific mite—a pest of equal importance in the apple-producing area of eastern Washington. Some investigations directed against the squash bug with a 3 percent D.D.T. dust seem to have satisfactory results.

There is also the question of toxicity resulting from residues of D.D.T. adhering to products that have been dusted with the chemical. Rats that have been fed on diets containing 500 p.p.m. of D.D.T. develop tremors within 48 to 72 hours and, after death, show evidences of liver and kidney damage. Other incomplete experiments involve feeding albino rats with a lower concentration of the chemical.

The ultimate in pest control would be a synthetic insecticide which is highly effective against insects but leaves no residue toxic to humans on fruits and vegetables—and which is available in quantities at low cost.

Globulins Very Important

IF the researches of Dr. Paul R. Cannon and associates of the Department of Pathology, University of Chicago, are translatable into good-tasting processed foods, their producers will have some of the best sales promotion material in the entire food industry. Low-cost protein foods are due for a big run after the war, and the studies of the Chicago group add further impetus to the belief that no food manufacturer who has more than local distribution can grow without the aid of highly trained nutritionists on his staff.

Briefly, the thing that attracts our attention at this point is the discovery that the antibodies in the blood stream which combat infectious diseases are globulins. The globulins in the blood are derived from proteins in the food. Eat too little protein and there is too little globulin. Too little globulin and there is no immunity. Or, if there is an active immunity followed by lowered protein intake, the immunity seems to disappear. Health and immunity from infectious disease are seemingly more closely associated with proper nutrition than had ever before been considered possible.

If one's speculation on the possibilities for applying this discovery are reasonably correct, it may mean that quality control will perforce extend way back to the feed lot where animals are grown, or to the proper selection of varieties of plant life and their fertilizers where the food raw material is of vegetable origin. It will also mean that a new era in public health is not far away.

Safety Starts At the Top

UNTIL management considers accident prevention as important a part of its responsibility as "equipment" or "methods" or "sales policy," too many accidents will continue to occur. All of these other important responsibilities are planned. Personnel and funds are assigned to carry them out. Management then supervises and reviews the results and shows its interest at all times. But, with few exceptions, management does not show the same interest in its accident-prevention program.

The reason for the lack of sustained interest is probably traceable to the very character of the program. It is *prevention,* therefore intangible. One cannot say, "Today we prevented $1,000 worth of accidents." In spite of this negative character of accident prevention, the work and the results are very real.

To prevent accidents—and the cost of accidents—management needs to institute a real program covering:

1. Safer work methods and equipment.
2. Employee education.
3. Supervision of the safety program.

The most important of these is sustained interest in the supervision of the safety program. It is the most important, because without it the other two parts of the program—safer methods and employee education—will not function for very long.

More Packaging Supplies Needed

AN unexpected demand for packaging supplies will arise after V-E Day. It has been announced by the military authorities that all our unused equipment and supplies in Europe will be packed up for shipment to the Pacific theater of operations.

With such a prospect in the offing, it is unlikely that the collapse of Germany will ease up the packaging supply problem for some time to come.

It's the Nash!

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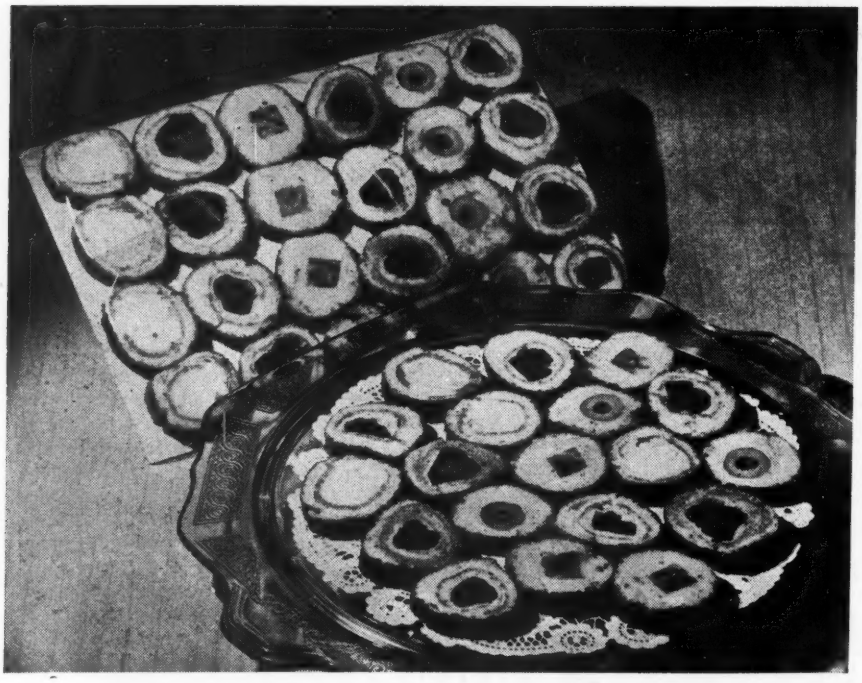
NEW PACKAGES & PRODUCTS



Party Food

QUICK FROZEN hors d'oeuvres are a specialty of the Dover Food Shop, New York, as an outgrowth of a party catering service. The product is distributed through regular frozen food outlets.

The fillings are spread on thin layers of specially prepared bread, then rolled, and the rolls quick frozen. For packing, the rolls are sliced while frozen, the slicer being the only "machine" in the shop at present. Slices are arranged on a cardboard tray, wrapped in moisture-vaporproof heat-sealing cellophane, with a small black and gold identifying label under the wrap.

Filling materials include cervelat, Cheddar cheese in sherry, liver, sausage and ham, combined with olives or pickles. All manufacturing and packing operations are done by hand.

Frozen Food Labels

PICTSWEET FOODS, INC., Mt. Vernon, Wash., has adopted reverse-printed transparent film for its frozen food carton wraps. The labels have a clean white background, with the informative lettering in red and green and the brand name in black and gold. A full-color picture of the product is shown in a circle on the top of the package.

The line includes asparagus, green beans, broccoli, brussels sprouts, cauliflower, golden sweet corn, lima beans, mixed vegetables, peas and carrots, spinach and cooked squash, as well as the peas. Fruits, mainly peaches, apricots, strawberries and red raspberries are also packed.

More Seafoods

SURF CLAMS, dredged from beyond the tide line on the Long Island south shore, are being distributed by 40-Fathom Fish, Inc., Boston, Mass., both canned and quick frozen.

These large clams are opened by hand with a knife, then the entire stomach is removed to eliminate the problem of sand. After washing, the clams are quick frozen in plain 4-lb. cartons for institutional use or minced and canned for the convenience of the domestic user. No. 1 cans holding 5 oz. (drained weight) carry the regular blue and white 40-fathom label.

Surf clams have not heretofore had wide distribution, in spite of their particularly good flavor, because of difficulties in digging and cleaning them.

This Package Uses Pictures

COMMANDER-LARABEE MILLING CO., Minneapolis, has put its Airy Fairy cake flour in a new package, aimed at mass merchandising displays. Front and back of the label carry different pictures, or rather different parts of pictures, of a sponge cake and an upside-down cake, so arranged that when the cartons are put side by side on the shelf or

counter a large complete picture of either one or the other cake will be formed by two adjacent packages. The pictures are in natural colors against a green background, with the trademark and company name in white.

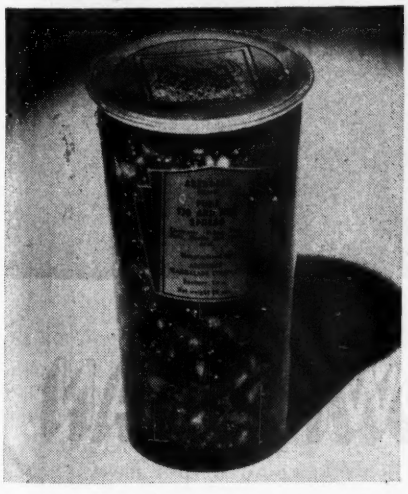
The flour is packed 2¾ lb. in an unlined carton, the label used as an overwrap.

Frozen Pears

BARTLETT PEARS, cooked with sugar and lightly spiced, make a quick frozen sauce distributed by Pratt's Fresh Frozen Foods, New York. These are cellophane wrapped and packed in waxed folding cartons, white with red lettering. Pears have been rare among frozen fruits so far, because of the limited supply of suitable fruit.

Fruity Spread

FIGS and cashew nuts are used with sugar, pectin and enough citric acid to give a tart flavor in Aberdeen Brand Pure Fig and Nut Spread.



The product, recently introduced, represents several years of experimental work. It is manufactured by the Aberdeen Marmalade Co., Danbury, Conn.

A tall tumbler with an edge-seal metal cap is used to hold 1-lb. Gold and black in the label harmonize well with the amber colored jam.

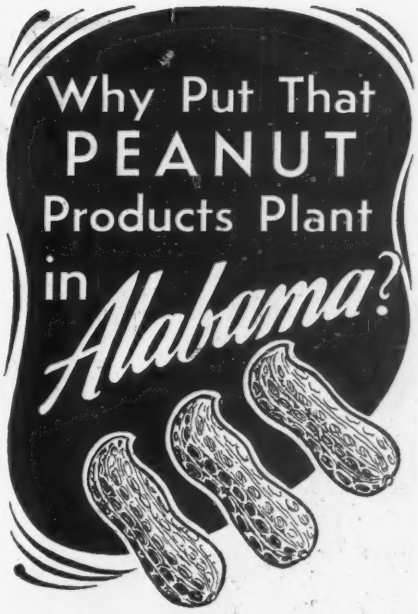
Dry Milk Comes Home

DRY SKIM MILK is being distributed to the retail trade in a few Southern states and in certain selected metro-

politan districts by The Borden Co., New York, under the name of Starlac. It is packed 1-lb. net weight in an Interstate Folding Box Co. type carton with heat-sealed parchment lining. The label is in yellow and blue.

The side and back panels of the carton are used for instructions on mixing and using the milk powder.

Wider distribution is planned as soon as processing equipment and supplies become available.



NO STATE offers greater opportunities to manufacturers of peanut food products—peanut butter, candy, confectioneries and bakery foods—than Alabama.

LARGE PEANUT PRODUCTION

During prewar years, 1937-41, Alabama picked and threshed 296,000 acres of peanuts, or approximately 103,000 tons, annually and 574,000 acres, or approximately 200,900 tons, in the year 1943. Thus Alabama can produce an almost unlimited supply of peanuts for the edible trade, production being largely limited by the demand. Major portion of this production was in Alabama's "Old Peanut Belt," comprising 9 southeastern counties.

OTHER FAVORABLE FACTORS

Abundant native labor; favorable transportation facilities; low-cost fuel and power; mild and equable climate.

For detailed information on opportunities for peanut products manufacture in Alabama, write Dept. F, Alabama State Chamber of Commerce Montgomery 1, Ala.

ALABAMA
STATE PLANNING BOARD
Montgomery 5, Alabama

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THERE must be quick action . . . materials for charging fire-fighting apparatus must be available for instant use.

That is why Cole Laboratories, Inc., Long Island City, N. Y., package their Foam Liquid and Speed Foam Drench in Crown cans. Completely protected by Crown cans, Cole products are kept laboratory-fresh . . . always ready for life—and property-saving service.

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FOOD INDUSTRY NEWS

THE PROCESSING PICTURE

Container Outlook for New Year Shows Improvement Over 1944

The supply of tin should be better and glass continues relatively free, but boxboard is very tight

GENERALLY speaking, the 1945 outlook for containers is better than in 1944. However, this is not true all along the line. The rate of tin plate production for the first quarter has been set at 900,000 tons. This compares with a schedule of 750,000 tons for the fourth quarter last year, 875,000 tons for the third quarter, 825,000 tons for the second quarter and 627,000 tons for the first quarter. Tonnage of tin plate for export remains unchanged at approximately 150,000 tons for the period.

The bottleneck in tin plate production, at the moment, is the supply of tin. The steel supply which has progressively eased in recent months has put products that can be packed in black plate in a very advantageous position.

Revision of order M-81, as contemplated, only seems to provide a mechanism by which manpower can be used in the manufacture of cans if and when the manpower becomes available. In early December it did not look as if a relaxation of the restrictions of order M-81 could be translated into more cans at an early date.

Fiber cartons are expected to continue to be in short supply. WPB officials have stated that in addition to the present demands large quantities of folding and setup boxes will be required to repack Army supplies for shipment from the European theater of war to the Pacific following V-E Day. Total food container requirements for the first quarter of 1945 are increasing, according to a report of WPB officials to the container board and fiber box manufacturers.

Production of paperboard depends upon the labor situation at the mills and upon adequate collections of the proper grade of waste paper. A pulp shortage in the first quarter of 1945 is officially forecast, with no real hope of improvement until Swedish pulp becomes available sometime after the defeat of Germany. Officials believe that the present rate of production will be maintained but the industry anticipates difficulty in doing so.

The supply of glassine and greaseproof papers during 1945 is expected to parallel closely the supply of fiberboard for cartons and other paper products. There is some possibility that the situation will even deteriorate until the military situation permits an increased amount of woodpulp to be imported.

Supply of glass containers for food processing is expected to remain approximately in 1944 position, that is, relatively free. Because of the improved supply of strip steel, the closure situation is expected to be much better in 1945 than it was in 1944.

Beverage Bottlers Discuss 1945 Supplies

REPORTS on 1945 prospects of supplies for the industry characterized the annual meeting of American Bottlers of Carbonated Beverages, in Chicago, November 28, 29 and 30.

William A. Brown, Jr., of Liquid Carbonic Corp., New York, stated that the CO_2 supply can be adequate for the next season if the war in Europe is over in late winter or early spring and that the supply can be very short if the war continues beyond that time because new needs for CO_2 are constantly appearing as the war progresses.

In reviewing the availability of ingredients, W. R. Nolan, chief, soft drink section, WFA said the present allocation of citric acid is 40 percent of normal use. Faced with a very poor crop of lemons in 1944, production of citric acid from lemons has practically stopped. This curtailment added to no importations from Italy means that the allocations for the months ahead will be no larger than the present quota. The lemon oil supply is about the same as that of citric acid. The supply of tartaric acid should improve. There are sufficient supplies of phosphoric acid and oil of orange.

The following officers were elected for 1945: President, Joseph W. Milner, Coast Coca Cola Bottling Co., Gulfport, Miss.; Vice-President, Thomas F. Mansfield, Mansfield Beverage Co., Inc., Newark, N. J.; Treasurer, Joseph LaPides, Pepsi-Cola Bottling Co., Baltimore, Md.; Secretary, John J. Riley, Washington, D. C., reelected.

FROZEN FOOD CASE

Here is a display case designed to encourage self-service of frozen foods. It is described in a circular issued by Tyler Fixture Corp., Niles, Mich. Self-service cases will simplify the distribution problem facing the postwar frozen food industry.

Fluoride Disinfectant Found in Seized Beer

BEER containing fluorine has been seized in large quantities by Food and Drug Administration inspectors. This toxic contaminant was evidently a residue of a brand of disinfectant which used a fluoride as its active component. Some of the beer contained as much as 15 milligrams per liter of soluble fluorine.

The officials interested point out that the management's desire for disinfection was commendable. But their technic of use was deplorable. They evidently failed completely to flush out tanks and lines which has been disinfected before new liquids were pumped through them.

Refrigerating Group Talks About Food

FOODS are ranked as of first importance for postwar research in refrigeration by the members of the American Society of Refrigerating Engineers, according to the report on a survey among its membership presented at the 40th annual meeting of that organization in New York, December 10 to 13. This interest was further shown by the discussion following a paper concerned with food quality which was included in the technical program.

Using an experimental unit designed to produce many different freezing conditions, John F. Nicholas has been able to show the effect of wrapping on the three stages of freezing, which he identifies as precooling, ice crystal formation and subcooling to near the temperature of the refrigerating medium. The center portion of unwrapped whole tomatoes, in moving air at about —40 deg. F., required 31, 10 and 30 minutes, respectively, to pass through these stages. Small packages of fruits and vegetables required, in the portion near the center, 65, 45, and 80 minutes, respectivel,y for the same phases.

J. F. Stone, manager of the refrigeration division, Johns Manville Corp., was elected president of the society for the coming year.

Oyster Fill

A STANDARD has been issued by the Food and Drug Administration defining the water content and proper fill of containers for canned oysters. This regulation takes effect on February 23, 90 days from its publication in the *Federal Register* of November 25. This new standard also prescribes the method of determining the drained weight and other features of compliance with the requirement.

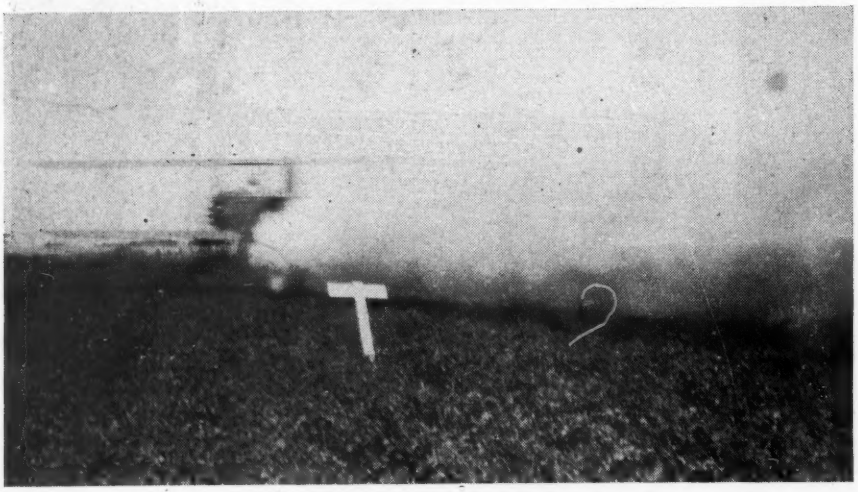
Plant "A" Awards

OUTSTANDING performance in food processing has won the War Food Administration achievement "A" awards for the following food plants:

Poultry Producers of Central California, Petaluma, Calif.; J. D. Jewell, Gainesville, Ga.; White City Provision Co., Chicago, Omarga Canning Co., Omarga, Ill.; Perry Packing Co., Manhattan, The Midland Flour Milling Co. (Newton Milling and Elevator Co.), Newton, Kan.; Deerfoot Farms Co., Southboro, Mass.; The Midland Flour Milling Co., North Kansas City, Mo.; The Borden Co., Bainbridge, N. Y.

Tomato Pulp Standard

U. S. STANDARDS for grades of canned tomato puree (tomato pulp) have been issued by WFA effective January 1. These standards supersede the standards in effect since Jan. 25, 1934.



ARTIFICIAL FROSTS

Chemical sprays and dusts forming artificial frosts are being applied here by airplane to hasten tuber maturity. These "frosts" are reported to have shown considerable promise in recent tests conducted in Idaho by Dr. Lief Verner and John L. Toves.

Canned Peaches Stir Government Agencies

PROBABLY for the first time, the Food and Drug Administration was recently opposed, in part, by an important food trade association in a case involving the seizure of a sample of processed food. National Canners Association participated with Gerber Food Products Co. in defending that company against criminal charges in a seizure of canned peaches. The company was acquitted, but comment indicates that several basic principles still remain at issue, though not before any court.

The contamination question related to the presence in the food of minute insect fragments and decomposed portions of the fruit, which were detected by microscopic analysis. The defense sought to prove that this represented no more than the unavoidable presence of these contaminants despite careful factory operation. The reasonableness of the application, by F&DA, of the admittedly proper rule against contamination was at issue even though the court proceedings did not permit trial of the case on that specific basis.

The judge's ruling and the jury finding indicate an acceptance in this proceeding that there was not adequate basis for criminal action. The question remains open, however, as to how similar cases will be handled by F&DA and whether this one successful defense constitutes any protection by precedent for this or any other company in future cases. One important question is whether the same finding would have been reached had the proceeding been merely a libel against goods or a civil action seeking an injunction against distribution of goods.

Salmon Claims

ALASKA'S multi-million dollar salmon canning industry is apprehensively waiting the next move by Secretary of the Interior Harold L. Ickes on a petition of 5,000 Alaskan Indians, based on aboriginal claims, seeking to set aside virtually all of southeastern Alaska with its fishing rights for the exclusive use of natives.

Food Standards

THE FOOD and Drug Administration, through the Federal Security Agency, has recently issued "Definitions and Standards For Food," a publication containing the definitions and standards for food that were promulgated before June 1, 1943, under the Federal Food, Drug and Cosmetic Act as amended by the order on enriched flour. The appendix contains the only definition and standard that has been promulgated since that date.

Since stainless steel retains its toughness at low temperature, it gives satisfaction in this immersion type quick-freezing unit.

In Quick-Freezing Plants *Stainless Steel* Helps to Protect Food Quality

• In quick-freezing plants stainless steel is chosen for equipment because it resists corrosion from moisture and food acids, is attractive in appearance, easy to keep clean and sanitary, and lasts for years.

In equipment both for food preparation and for the freezing process, stainless steel helps to provide the protection so necessary where food is handled, and contributes to efficient, profitable plant operation.

The use of stainless steel cuts maintenance time and expense and helps to maintain high-quality production because its corrosion-resistant surface will not affect food flavor or color.

These properties make stainless steel a practical choice for equipment, not only in plants for the processing of frozen foods, but in canning, dehydration, beverage, meat packing, and dairy plants as well.

Although we do not make stainless or any other steels we do make many ferro-alloys that give new properties to steel and improve its quality. Our metallurgical engineers have accumulated a vast amount of information on the various types of stainless steel. If you are interested in any of the many applications of stainless steel, write to us for further information.

BUY UNITED STATES WAR BONDS AND STAMPS

Stainless steel utensils, trays, scales, and fillers are used in this strawberry freezing plant.

In this egg freezing plant, stainless steel is used for churn, tanks, piping, and separators.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet Trade Mark
Ferro-Alloys & Metals

No Increase Foreseen For Plant Equipment

A LATE November announcement of a possible increase in the quotas for beverage, confectionery and tobacco processing machinery was without foundation. Requirements of the munitions program which stopped WPB Chairman J. A. Krug's reconversion plans in their tracks are responsible for the change of plan. On inquiry, WPB stated that there will be no increase in the quotas. It now is believed in Washington that there will be no relaxation in the restrictions on equipment production until Victory in Europe has been achieved and possibly not until some time after that.

Moisture Tester

COMPLETE removal of all "free moisture" from flour, cereal products and like materials without damaging other ingredients is said to be possible by the use of a high-frequency electric current apparatus invented by Alfred Christie, Grain Products Branch. War Food Administration. With this new method, heating begins at the center of the sample and drives the moisture out. As the moisture is driven out, the temperature decreases. Hence, when all the moisture has been removed, the sample is sufficiently cool to be weighed immediately.

Standards of Identity Fixed for Chocolate

AN exact definition of identity of products made from cacao has been promulgated by the Food and Drug Administration following the extended hearings and investigations that originated more than a year ago. The findings of fact and the regulations establishing a definition and standard of identity were published in the *Federal Register* on December 6. These regulations become effective April 1.

The subjects covered by these definitions of identity are: Cacao nibs, chocolate liquor, breakfast cocoa of varying grades, sweet chocolate and milk chocolate, and various specialties, such as skim-milk chocolate, buttermilk chocolate, and others containing cocoa or chocolate.

Two Food Conferences

THE Department of food technology of the University of California is planning a one-day dehydration conference on January 6, and a food processors conference, February 19-21.

Wide World

FIELD BAKERY

Our fighters don't have to exist on field rations wherever a portable kitchen can be set up. This bread is being baked close to the fighting front in Belgium.

In announcing the conferences, the school urges those coming from a distance to make certain of their hotel reservations as rooms are not to be had otherwise.

Millers Like Subsidies And Uniform Packages

THE American Millers Association adopted resolutions favoring continuance of uniform wheat subsidies and the present decimal weights package law, in a one day meeting at Louisville, Ky., Nov. 13.

Clark Yager, vice-president of Ballard & Ballard, flour millers and makers of Oven-Ready biscuits, spoke in favor of subsidies and declared that no other method has proven to be as practical.

The association declared the present uniformed package requirements have proven satisfactory.

Yeast Approved

DEBITTERED dried brewer's yeast has been approved for use in Army biscuits by the QMC Subsistence Research Development Laboratory, according to revision of CQD 176B dated, December 5.

In addition to primary grown dried yeast, the exclusive use of which was specified in 176A June 12, 1944, biscuit manufacturers holding Army contracts may now use properly debittered dried brewer's yeast.

DEVELOPMENTS IN DISTRIBUTION

Butter Institute Asks Change in Regulations

ADJUSTMENTS in OPA ceiling prices for dairy products, revision of WFA schedule of dairy feed payments, and cancellation of the roll-back subsidy were urgently recommended to the U. S. Department of Agriculture by the American Butter Institute at its 36th Annual Meeting in Chicago.

Inequitable relationships in the ceiling prices for the various dairy products, lack of a provision in the schedule of dairy feed payments to make 1 lb. of butterfat marketed as cream equivalent to 100 lb. of whole milk and the inequities of the roll-back subsidy are held responsible for the downward trend in butter production for the past two years. The thinking of the butter industry is that this trend, if it continues, will destroy butter as the economic balance wheel or stabilizer of the dairy industry as a whole.

Brigadier General Carl A. Hardigg, Perishable Branch, Subsistence Division, Office of Quartermaster General, warned that the end of the war in Europe will not mean a decrease in demand for butter by the Armed Forces. He said "On the other hand, the requirement for fresh provisions, such as butter, would tend to increase as the troops return from combat to garrison conditions.

Labeling Exemptions Ruled for Bulk Goods

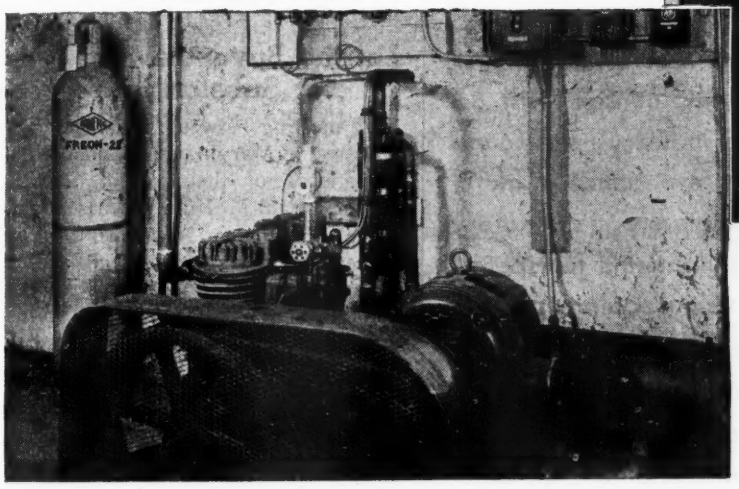
BULK shipments of foods or drugs must be labeled precisely as though they were consumer-package shipments. Exemption from that ruling is provided under regulations of Food and Drug Administration, if either of two alternative plans are followed. The shipper may take care to supervise the labeling of the bulk goods when repackaged for small-scale distribution. This is usually impracticable if it is a customer's establishment. Hence the rules permit the original bulk shipper to take from the customer a pledge regarding the labeling of the repackaged goods, so that he has every reason to expect that the repackaging label will comply fully with the law.

These facts were made clear in the case brought recently by F&DA against a big shipper of bulk goods who failed to take either of these precautions. His responsibility for the bulk shipment was held by the court; and the Supreme Court has now refused to review the decision.

"FREON-22"

Found highly efficient in locker storage plants

Reports Consolidated Conditioning Corporation



Interior of locker storage plant in Bethel, Connecticut, the refrigeration equipment for which was furnished and installed by Consolidated Conditioning Corp., Mt. Vernon, N.Y.

◀ *Carrier compressor used in Bethel installation.*

ONE OF THE principal operations of Consolidated Conditioning Corporation, Mt. Vernon, New York, is the furnishing and installation of refrigeration equipment in locker storage plants.

"We have found that 'Freon-22' has a decided advantage over other refrigerants for low temperature applications, since positive machine suction pressures can still be maintained as low as -40°F., a condition very favorable in a refrigeration system."

In addition to the highly efficient operation of "Freon-22," stated above, other advantages reported are its complete safety, ease of replenishment in case of loss through leakage, and reduction of service and maintenance to a minimum.

"Freon-22" is what engineers call a "natural" for low temperature refrigeration such as locker plants, food processing, and for use in auxiliary apparatus for many specialized industrial applications.

And, as Consolidated Conditioning Corporation adds: "We have every reason to believe that 'Freon-22' will play a prominent part in the refrigeration industry at the conclusion of the war in the preservation of food as well as for other low temperature requirements." *Kinetic Chemicals, Inc., Tenth & Market Streets, Wilmington, Delaware.*

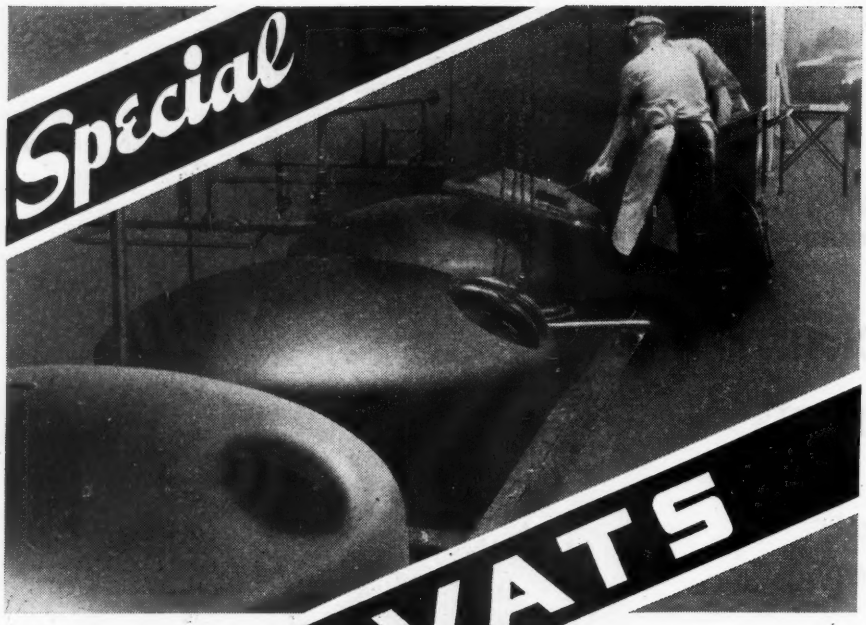
UNTIL VICTORY IS ACHIEVED—BUY MORE WAR BONDS!

KINETIC

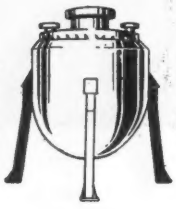
FREON *safe refrigerants*

REG. U. S. PAT. OFF.

"Freon" is Kinetic's registered trade mark for its fluorine refrigerants.

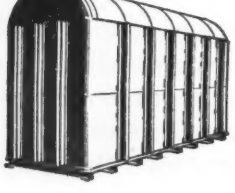


Also---
KETTLES



BINS

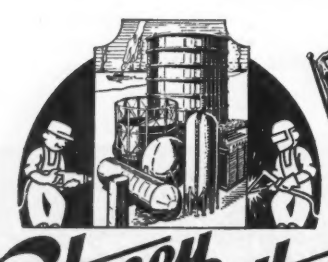
TANKS



If you have a problem involving special processing equipment, consult with us. Others in the Food Industry have found our long and varied experience in metal fabrication a completely satisfactory answer to their requirements for special storage and processing equipment.

Photo above shows a battery of Stacey Brothers special high pressure rendering vats of all-welded construction. We regularly produce such equipment in aluminum, steel, stainless steel, and other alloys.

Stacey Brothers produce work to A.S.M.E. standards, from No. 16 gauge sheet metal up to three inches in thickness. Send us your specifications and drawings. We shall be pleased to submit quotations and recommendations.



The STACEY BROS. GAS CONSTRUCTION CO.

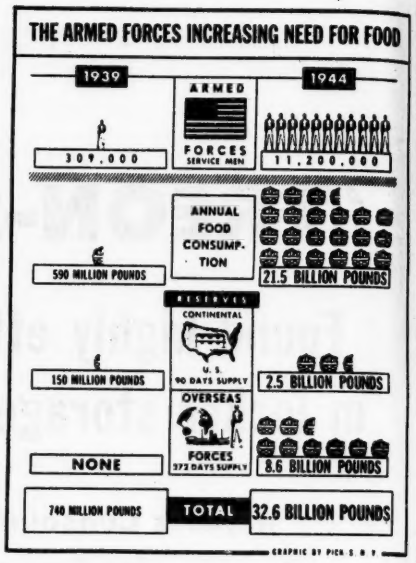
ONE OF THE DRESSER INDUSTRIES

5535 Vine Street Cincinnati 16, Ohio

STORAGE and PROCESSING EQUIPMENT

Stacey Brothers

ENGINEERS • FABRICATORS • RECOGNIZED EXPERIENCE & FACILITIES



THE FOOD BATTLE

Here is a graphic illustration of what the food industry is up against in its winning battle to supply the immediate and the reserve food requirements of our armed forces.

Let the Buyer Beware of Substandard Foods

THE meeting between War Food Administrator Marvin Jones and the Administrator of the Federal Security Agency, Paul McNutt, forecast to take place sometime in November or early December, when the official attitude regarding the application of Pure Food laws to sales of government food surpluses was to be discussed, had not materialized by late December. The official Food and Drug policy, therefore, remains without change.

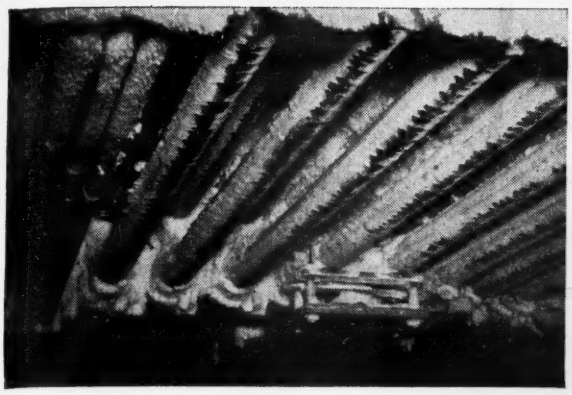
It is known that Food and Drug officials hope there will be no occurrence which requires drastic action from another government agency. It may be expected, however, that foods found to be below minimum standards will be confiscated and destroyed as quickly if sold by the government as would be the case if they had been sold by a private individual.

Less Food in Europe

EUROPE'S food situation has taken a turn for the worse, according to the Office of Foreign Agricultural Relations. And if imports are not increased, the caloric value per capita on the Continent (exclusive of Russia) will be only about 85 percent of the prewar average.

Tomato Pulp Standard

U. S. standards for grades of canned tomato puree (tomato pulp) have been issued by WFA, effective January 1. These standards supersede the standards in effect since Jan. 25, 1934.



Above—At the ceiling in the 18-below-zero hardening room of H. P. Hood's big Boston ice-cream plant, this Thermohm electric-resistance thermometer is reporting the temperature to a Micromax Recorder located several hundred feet away.

Right—Temperatures of ten storage rooms in the plant are recorded by the Micromax Strip-Chart Recorder at which the compressor engineer is looking. Located in the compressor room, this instrument saves much time. A second one is on order for a Hood plant.

"It's a Matter of Economics" In H. P. Hood's Refrigeration Departments

"Using that Micromax Recorder for storage temperatures is purely a matter of economics with us" says a spokesman for H. P. Hood & Sons, Inc., big Boston Dairy and storage firm.

"The Micromax, located in our compressor room, records temperatures from all over our plant — from rooms right next door and other places hundreds of feet away.

"Before we had the Micromax, we measured those temperatures either with stem-thermometers or with recording thermometers which had to be located inside the room they were measuring.

"To keep posted on these temperatures, each shift engineer had to go around and read all those instruments. Not only did this cost us time, sending trained engineers around reading instruments; it cost far more in wasted refrigeration, because a storage space couldn't be checked constantly, and of course no space is going to stay at temperature without being watched.

"However, the method we used was standard in our industry; all we could do was apply it well, and watch for a better way to record remote temperature. And, when the Micromax Recorder, with Thermohm resistance-thermometer bulbs, was perfected for jobs like ours, we got one.

"It has worked out perfectly; the engineer just stays right at the control board and reads temperature without moving a foot. We hold the rooms much nearer the ideal point, and use less refrigeration to do it. Micromax is worth-while, economical equipment for us."

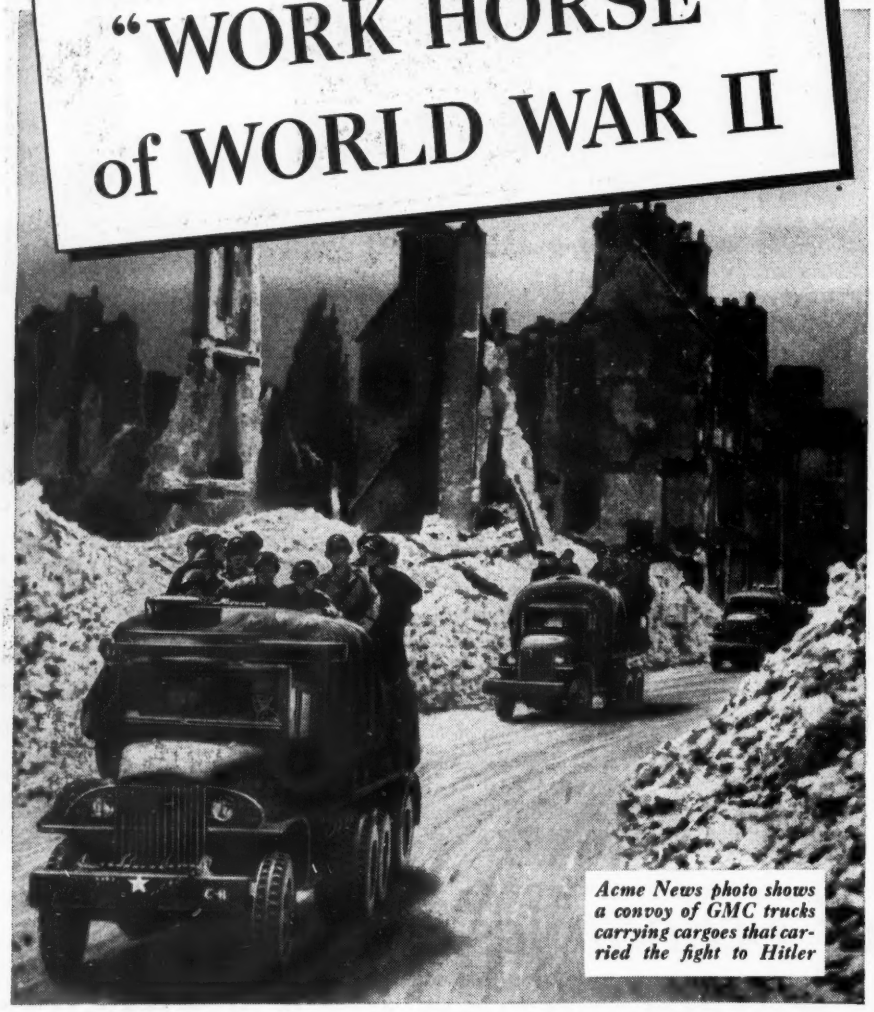
An L&N engineer will be glad to confer with you about a specific problem in Micromax Temperature Recording, or will send Catalog N-33C, as you prefer.

Jrl Ad N-33C-221(1)

depends on me!
A Slogan For Every American

LEEDS & NORTHRUP COMPANY, 4912 STENTON AVE., PHILA., PA.
LEEDS & NORTHRUP
MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

"WORK HORSE" of WORLD WAR II



Acme News photo shows a convoy of GMC trucks carrying cargoes that carried the fight to Hitler

When a high-ranking Army Officer recently referred to the GMC 2½-ton "six-by-six" military truck as the "Work horse of the War," no name was ever more appropriately applied.

It works for the Artillery pulling guns and carrying ammunition. It helps the Engineers repair roads, bridges and damaged defenses. It works for the Signal Corps carrying poles and wire and radio equipment. It helps Ordnance repair tanks and trucks and arms of all types. It works for the Transportation and Quartermaster Corps transporting everything it takes to keep an Army on the offensive. It performs equally essential service for the Navy, Marines, Air Forces and Coast Guard.

Is it any wonder, then, that our fighting forces have already requested and received more than 450,000 GMC military vehicles . . . that thousands more are going into the Service each month!

In addition to being one of the largest producers of military vehicles, GMC is also building many commercial trucks for essential users. If you are eligible for a new truck, your GMC dealer will gladly help you fill out an application. Remember, too, that GMC is headquarters for the original truck-saving Preventive Maintenance Service.

INVEST IN VICTORY
BUY MORE WAR BONDS

GMC TRUCK & COACH DIVISION
GENERAL MOTORS

HOME OF COMMERCIAL GMC TRUCKS AND GM COACHES
VOLUME PRODUCER OF GMC ARMY TRUCKS AND AMPHIBIAN "DUCKS"

RAW MATERIALS

British Cocoa Policy Cause for Concern

BRITAIN'S recently announced policy on cocoa is worrying American cocoa importers. As submitted to Parliament, the policy calls for continuance after the war of the emergency wartime centralization in the hands of a single United Kingdom agency.

Normally, the United States consumes about half the world's cocoa output, receiving about 45 percent from hemisphere sources and 55 percent from Africa.

New Sugar Allotments Show Dwindling Stocks

ALLOTMENTS of sugar to most industrial users was reduced from 80 percent to 70 percent of their 1941 use, on January 1. Producers of bread, bakery and cereal products are exempted from this reduction, retaining their former 80 percent allotment.

Producers of jams, jellies, preserves, marmalades and fruit butters are restricted to 70 percent of their 1944 use and will no longer be granted "provisional allowances," that is, allowances limited only by the number of units produced. Fruit packers are reduced from 100 percent to 90 percent of the quantity of sugar used in 1941.

Announcement of these restrictive OPA regulations coincided with a WFA report showing sugar stocks on November 30 to be 1,039,630 short tons, compared with 1,542,566 a year ago. Low as this stock position was, it more than doubled the 465,000 tons shown by the Food Industries War Committee (see page 82) to have been on hand October 1.

SCHEDULE OF EVENTS

JANUARY

6—University of California, Division of Food Technology, 5th dehydration conference, Berkeley, Calif.
15–17—Army Food Service Conference under auspices of Army Air Forces, San Antonio, Tex.
16–18—U. S. Brewers Foundation, annual meeting, Drake Hotel, Chicago.
24–27—National Dairy Council, annual meeting and winter conference, Hotel Statler, Cleveland.

FEBRUARY

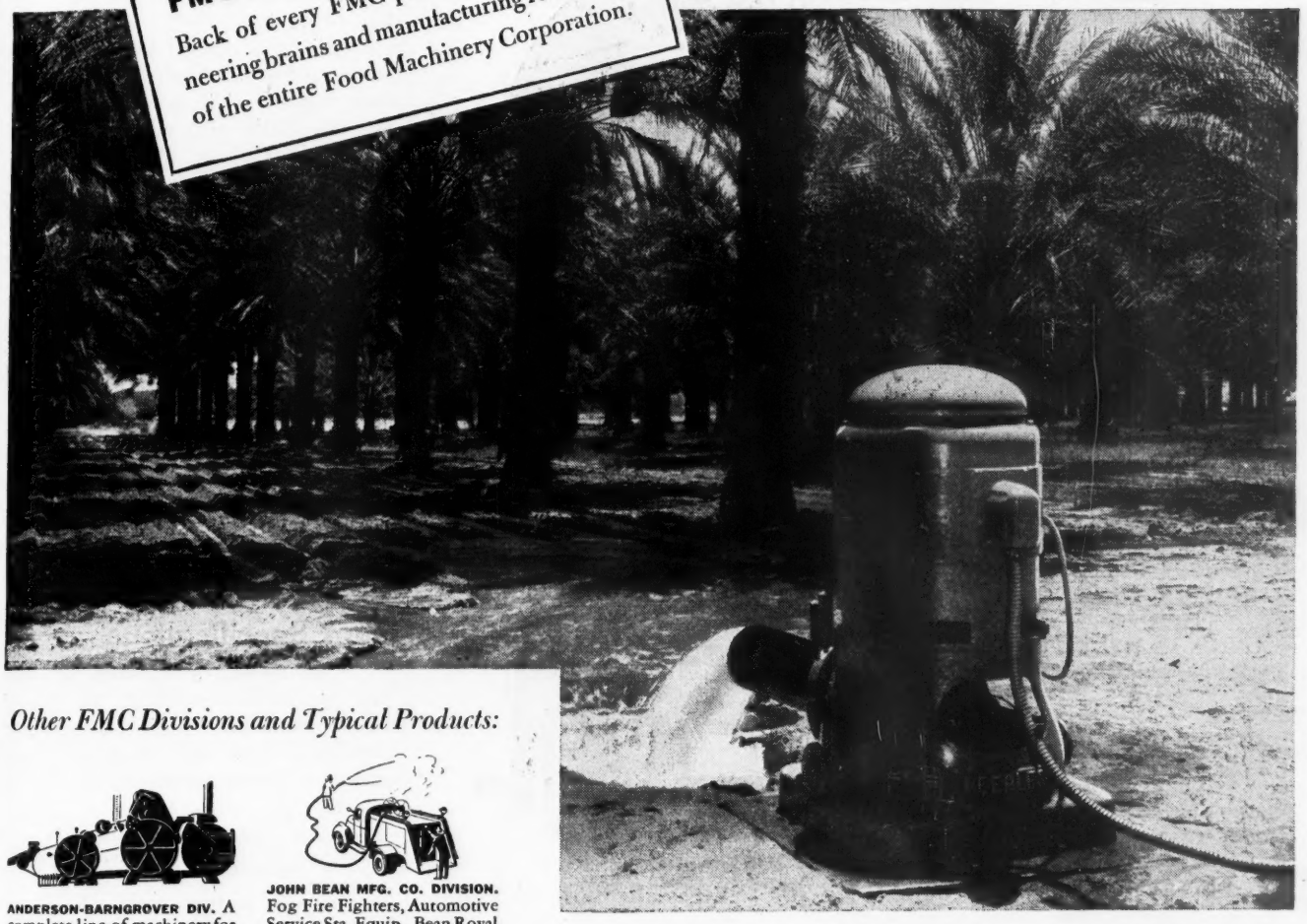
4– 5—Food Processors Conference, Chicago; General Sessions, Hotel Stevens.
6—National Canners Association, Hotel Stevens.
6—National Dehydrators Association, Hotel Sherman.
6—National Preservers Association, Hotel Morrison.
6—National Association of Frozen Food Packers, Hotel Stevens.
6– 7—National Pickle Packers Association, annual meeting, La Salle Hotel.
7—Canning Machinery and Supplies Association, Hotel Stevens.
19–21—University of California, food processors conference, Division of Food Technology, Agricultural Hall, Berkeley, Calif.

Another product of the Company that makes

FMC Food Canning Machinery

Back of every FMC product are the engineering brains and manufacturing resources of the entire Food Machinery Corporation.

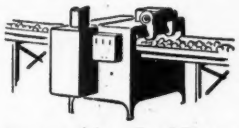
FMC's SPRAGUE-SELLS DIVISION
Manufacturing a complete line of Food Canning Machinery. Hoopeston, Illinois.



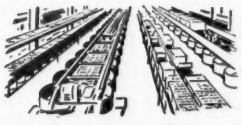
Other FMC Divisions and Typical Products:

ANDERSON-BARNGROVER DIV. A complete line of machinery for canning foods. San Jose, Calif.

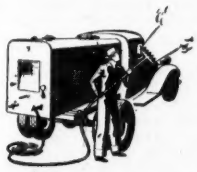
JOHN BEAN MFG. CO. DIVISION. Fog Fire Fighters, Automotive Service Sta. Equip., Bean Royal Spray Pumps. Lansing, Mich.



TEXAS DIVISION... Food Protective Processes, Fruit & Vegetable Packing Equipment, Canning Machinery. Harlingen, Texas.

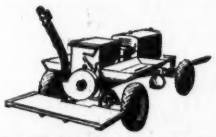


FLORIDA DIVISION... Citrus and Vegetable Packing Equipment, and Food Protective Processes. Dunedin and Lakeland, Florida.



BEAN-CUTLER DIVISION... FMC Fog Fire Fighters, Crop Sprayers and Fruit and Vegetable Packing Equipment. San Jose, Calif.

"WATER BUFFALO" amphibious tanks. 7 of Food Machinery Corporation's 14 major factories are making "Water Buffalos" or sub-assemblies.



NIAGARA SPRAYER & CHEMICAL CO., INC. DIV. Insecticides to protect crops from insects, diseases. Middleport, N.Y.; Jacksonville, Fla.; Burlington, Ont., Canada.

RIVERSIDE DIVISION. Citrus Packing Equipment, Automatic Box Making & Lidding Machinery. Fruit and Vegetable Protective Processes. Riverside, California.

Peerless Pumps

...bring deserts to life...supply water for entire cities

The irrigation pump pours out torrents of cool, clear water from deep underground, and arid wasteland turns green and bears fruit. In great cities and humming factories, batteries of pumps supply hundreds of thousands of gallons of life-giving water every minute. *Wherever water is pumped*—cities, factories, ranches, overseas with our armed forces—Peerless Pumps are known and preferred. Whatever its type—Turbine, Hi-Lift or Hydro-Foil—every Peerless Pump embodies the superb engineering, advanced design and sound construction that is typical of *all* products made by FMC.

Lakeland
Riverside
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Los Angeles

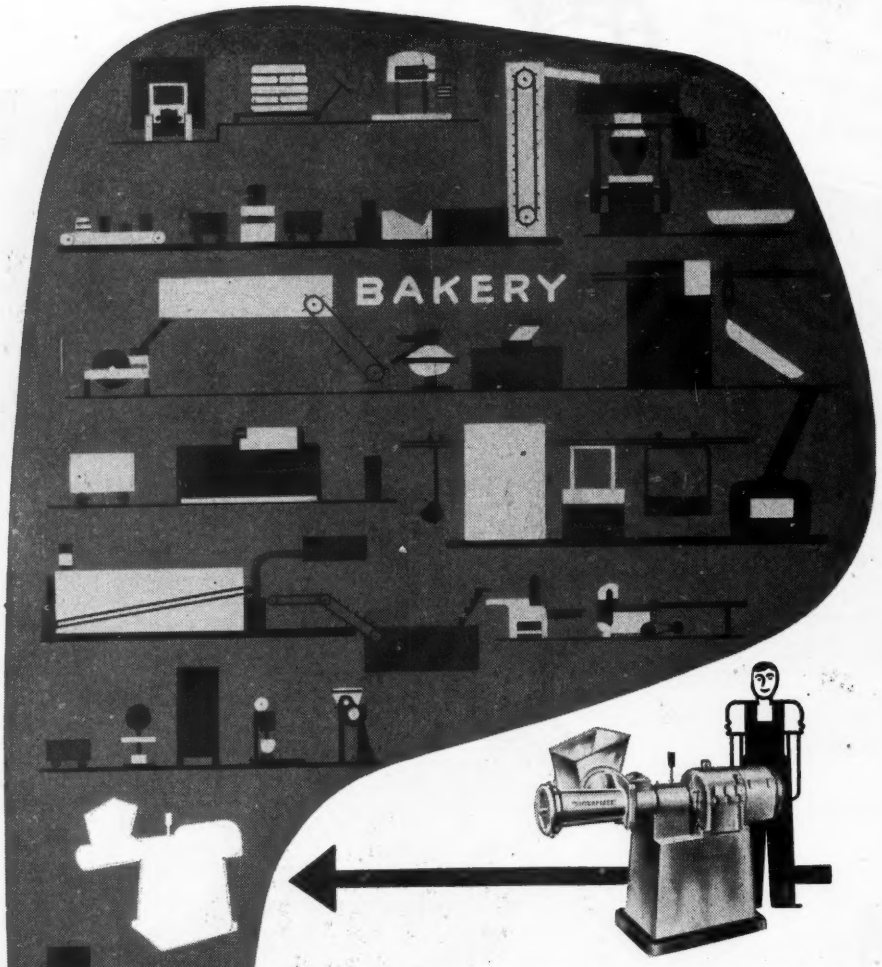
FOOD MACHINERY CORPORATION

EXECUTIVE OFFICES: SAN JOSE, CALIFORNIA

Peerless Pump factories are located at Los Angeles and Fresno, California; Canton, Ohio

Bakers, packers, other processors

—all employ "Enterprise" cutting



Fruits aren't easy to cut, especially those with high sugar content . . . yet the "Enterprise" Master Chopper gives exactly the reduction you want, without difficulty. Does an outstanding job on nuts, too.

Not only bakers and pastry chefs—but ice cream manufacturers, meat packers, mince-meat makers, canners . . . all have proved that "Enterprise" Choppers help turn out a better product at a *lower installation, operating and maintenance cost.*

"Enterprise" welcomes special food reduction problems. Our experts have been solving them for three quarters of a century. We shall be glad to help you.

ENTERPRISE

MANUFACTURING CO. OF PA.

THIRD & DAUPHIN STREETS, PHILADELPHIA 33

GENERAL

WFA Reorganizes Its Administrative Setup

IN an administrative reorganization of WFA the offices of Distribution and Production are abolished and the functions of the latter, with respect to feed management and food production are transferred to the Agricultural Adjustment Agency. Three new offices are set up—Basic Commodities under Carl C. Farrington, Marketing Services, and Supply under Lee Marshall, who had been head of the Office of Distribution and who will continue to carry out most of the functions of that office.

Tolley Appointed

PRESIDENT Roosevelt has designated Howard R. Tolley, Chief of the Agriculture Department's Bureau of Agricultural Economics, to be U.S. Representative on the United Nations Interim Commission on food and agriculture, the State Department announced. He replaces Paul H. Appleby, resigned.

More Specifications Issued by Army Corps

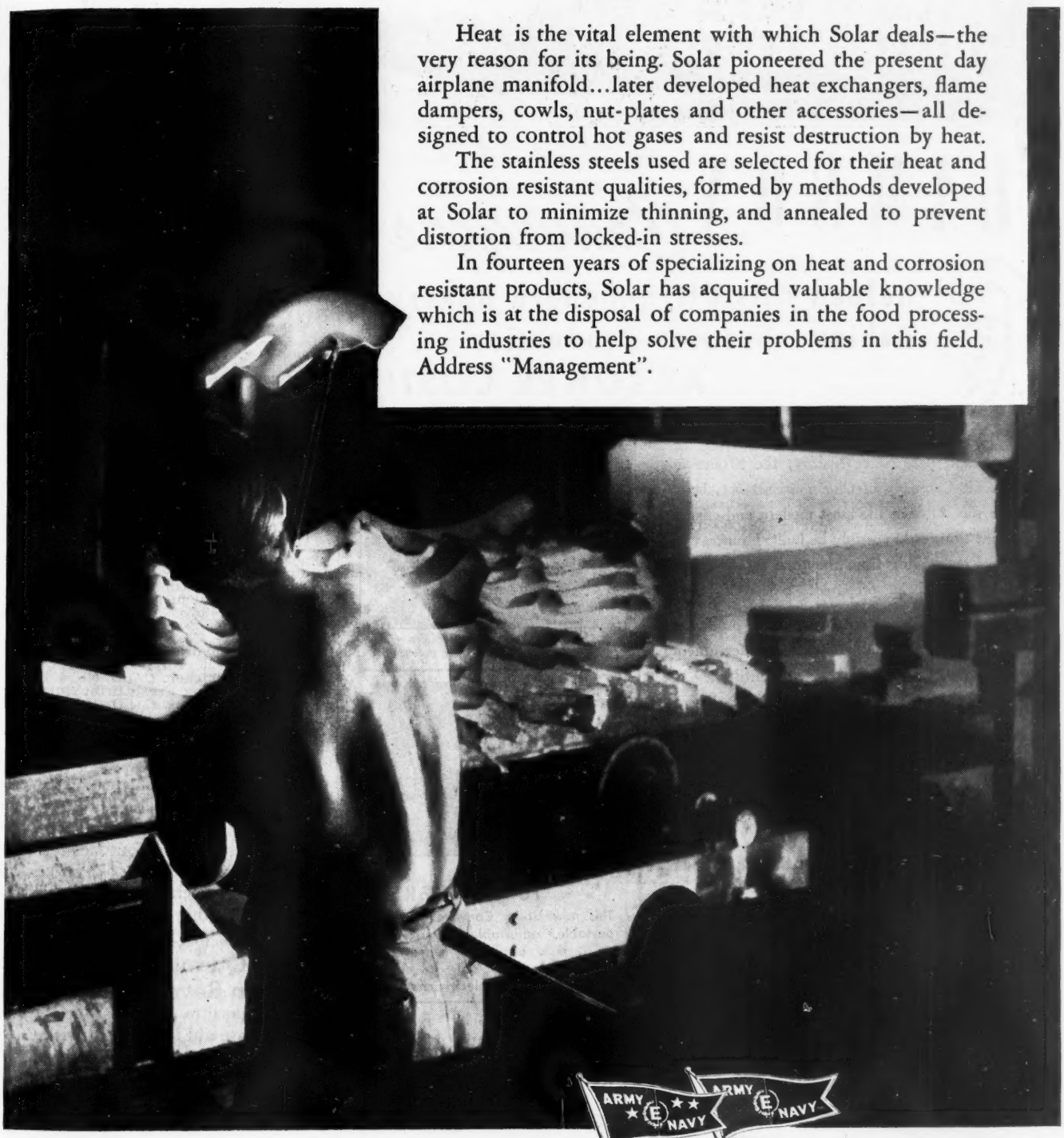
THE Quartermaster Corps has issued the following new specifications. They are listed with the Chicago Quartermaster Depot number and date of issue:

Airborne Life Boat Ration, C.Q.D. No. 320, Sept. 27. Air Crew Lunch, C.Q.D. No. 319, Sept. 15. Canned Sliced Bacon, C.Q.D. No. 155A, Oct. 14, 1943, Amendment-1, Sept. 12, 1944. Canned Luncheon Meat, C.Q.D. No. 48A, Sept. 30, superseding C.Q.D. No. 48, June 2, 1942. Canned Vienna Sausage, C.Q.D. No. 46B, Dec. 4, 1942, Amendment-2, Oct. 7, superseding Amendment-1, Dec. 28, 1942. Canned Pineapple Juice, C.Q.D. No. 97A, Nov. 26, 1943, Amendment-1, Oct. 7. Dehydrated Carrots, C.Q.D. No. 73C, Sept. 12, superseding C.Q.D. No. 73B, March 15. Ham and Eggs with Potatoes, C.Q.D. No. 198, Sept. 2, Amendment-1, Sept. 18. Labeling and Marking of Metal Cans for Subsistence Items, C.Q.D. No. 107A, Feb. 21, Amendment-2, Oct. 5, superseding Amendment-1, April 5. Pan-coated Confections, C.Q.D. No. 184A, Sept. 29, superseding C.Q.D. No. 184, July 3. Synthetic Grape Beverage Crystals, C.Q.D. No. 148A, Sept. 13, superseding C.Q.D. No. 142, July 17, 1943.

Packing of Shell Eggs for overseas shipment, C.Q.D. No. 334, Oct. 19. Dehydrated White or Irish Potatoes, C.Q.D. No. 59G, Oct. 26, 1944, superseding C.Q.D. No. 59F, June 23, 1944. Butterscotch Sandwich Cookie, C.Q.D. No. 321, Oct. 7, 1944. Emergency Parachute Ration, C.Q.D. No. 302, July 17, superseding Amendment-1, Aug. 29, 1944. Dry Milk; Whole and Nonfat Solids, C.Q.D. No. 166A, April 8, 1944, Amendment-1, Oct. 17, 1944. Dehydrated Cabbage, C.Q.D. No. 58B, Aug. 21, 1944, Amendment-1, Oct. 13, 1944. Sweet Chocolate Bar, C.Q.D. No. 168A, Oct. 4, 1944, superseding C.Q.D. No. 168, Jan. 15, 1944. Dehydrated Clingstone (Peeled) Peaches, C.Q.D. No. 182A, Sept. 30, 1944, superseding C.Q.D. No. 182, July 22, 1944. Canned Hamburgers, C.Q.D. No. 309, Aug. 16, 1944, Amendment-1, Oct. 18, 1944. Ten-In-One Ration, C.Q.D. No. 140B, Aug. 1, 1944, Amendment-2, Oct. 24, 1944, superseding Amendment-1, Aug. 29, 1944. Canned Pork Tenderloin, C.Q.D. No. 308, Aug. 14, 1944, Amendment-1, Oct. 18, 1944.

Turning on the Heat...

To Resist Heat Destruction!



Heat is the vital element with which Solar deals—the very reason for its being. Solar pioneered the present day airplane manifold...later developed heat exchangers, flame dampers, cowls, nut-plates and other accessories—all designed to control hot gases and resist destruction by heat.

The stainless steels used are selected for their heat and corrosion resistant qualities, formed by methods developed at Solar to minimize thinning, and annealed to prevent distortion from locked-in stresses.

In fourteen years of specializing on heat and corrosion resistant products, Solar has acquired valuable knowledge which is at the disposal of companies in the food processing industries to help solve their problems in this field. Address "Management".

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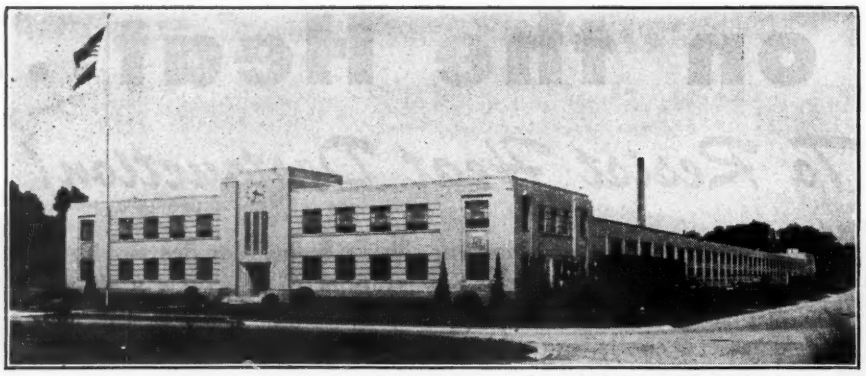
SOLAR

STAINLESS STEEL PRODUCTS

SOLAR

SOLAR AIRCRAFT COMPANY SAN DIEGO 12, CALIF. DES MOINES 5, IA.



The new Strietmann bakery has a floor space of 6½ acres

LAMSON *Conveyors*

helped this Ultra-Modern Bakery Achieve Greater Production . . . AT LOWER COST!

● Having outgrown several buildings in its long and progressive history, the Strietmann Biscuit Company of Cincinnati set out, before the war, to erect the most modern and efficient plant that could possibly be built. Lamson engineers cooperated from the time the first blueprints were being prepared.

● The result is a notably efficient production unit, with materials moving uninterruptedly from the receiving department, until they are delivered as finished products to the shipping platform. The flow of cartons is synchronized with the flow of goods, and both can be easily regulated. Provision has been made at every point for changes in size of cartons, and for shifting from dump-pack to hand-pack, as required.

● A detailed description of this superb plant appears in the "Lamson Conveyor" for December, 1943. If you would like a complimentary copy, please fill in and mail the coupon below.

Straight line production is accomplished by these main line conveyors

AVAILABLE to DEALERS

This new Utility Conveyor . . . portable, adjustable, reversible . . . is a packaged conveyor unit that needs only to be plugged into your electric circuit.

LAMSON *Conveyors*

LAMSON CORPORATION,
Syracuse 1, New York

Please send me a copy of the "Lamson Conveyor" describing the conveyor system in the Strietmann Biscuit plant.

Name .....

Company .....

Address .....

Pork Sausage Patties and Apples, C.Q.D. No. 313, Aug. 19, 1944, Amendment-1, Oct. 18, 1944. Pork and Corn, C.Q.D. No. 311, Aug. 16, 1944, Amendment-1, Oct. 18, 1944. Pork and Apple Sauce, C.Q.D. No. 312, Aug. 16, 1944, Amendment-1, Oct. 18, 1944. Roasted Salted Peanuts, C.Q.D. No. 177A, Sept. 7, 1944, Amendment-1, Oct. 25, 1944. Prepared Bread Mix and Yeast, C.Q.D. No. 333, Oct. 17, 1944. Airborne Life Boat Ration, C.Q.D. No. 320, Sept. 27, 1944, Amendment-1, Oct. 25, 1944. General Specification for Packaging and Packing for Overseas Shipment of Cereal Subsistence Items, C.Q.D. No. 160A, July 12, 1944, Amendment-1, Oct. 23, 1944.

Dehydrated Apple Nuggets (Crisps), C.Q.D. No. 78B, Oct. 28, 1944, superseding C.Q.D. No. 78A, April 8, 1944. Dehydrated Prunes, C.Q.D. No. 306A, Oct. 20, 1944, superseding C.Q.D. No. 306, July 28, 1944. Salad Dressing, C.Q.D. No. 45A, Oct. 18, 1944, superseding C.Q.D. No. 45, May 21, 1942, in lieu of Fed. Spec. EE-D-691a. Jellied Fruit Dessert, C.Q.D. No. 335, Oct. 25, 1944. Dehydrated Apricots, C.Q.D. No. 304A, Oct. 6, 1944, superseding C.Q.D. No. 304, July 26, 1944. Smoked Bacon, C.Q.D. No. 33E, Oct. 29, 1944, superseding C.Q.D. No. 33D, July 29, 1944. Smoked Hams, C.Q.D. No. 7E, July 10, 1944, Amendment-3, Nov. 4, 1944, superseding Amendment-2, July 28, 1944. Canned Pork and Gravy, C.Q.D. No. 150B, Oct. 31, 1944, superseding C.Q.D. No. 150A, April 7, 1944. Canned Boned Chicken or Turkey, C.Q.D. No. 34B, March 31, 1944, Amendment-1, Nov. 4, 1944. Complete Type K Ration Packaging and Packing Assembly, C.Q.D. No. 28G, Oct. 31, 1944, superseding C.Q.D. No. 28F, Sept. 22, 1944. Jellied Fruit Dessert, C.Q.D. No. 335, Oct. 25, 1944, Amendment-1, Nov. 4, 1944. Bouillon, C.Q.D. No. 52C, June 9, 1944, Amendment-1, Nov. 11, 1944. Beef and Pork Dinner, C.Q.D. No. 337, Nov. 8, 1944. Supplement Hospital Ration, C.Q.D. No. 148A, Nov. 9, 1944, superseding C.Q.D. No. 148, Sept. 9, 1944.

Canned Pork Tongues, C.Q.D. No. 339, Nov. 14, 1944. Packaging and Packing of Spices, C.Q.D. No. 178A, Nov. 3, 1944, superseding C.Q.D. No. 178, May 10, 1944. Packaging and Packing Tea for Overseas Shipment, C.Q.D. No. 342, Nov. 7, 1944. Vegetable Salad Oil, C.Q.D. No. 327, Nov. 9, 1944. Supplement Hospital Ration, C.Q.D. No. 148A, Nov. 9, 1944. Packing Non-Processed Cheese for Overseas Shipment, C.Q.D. No. 338, Nov. 13, 1944. Canned, Dehydrated Meat and Rice, C.Q.D. No. 325, Nov. 17, 1944. Canned, Solid Pack Chicken, C.Q.D. No. 332, Nov. 17, 1944. Packing Fresh Print Butter for Overseas Shipment, C.Q.D. No. 341, Nov. 18, 1944.

Marketing Questions

MARKETING specialists of the Bureau of Foreign and Domestic Commerce have prepared a "Check List for the Introduction of New Consumer Products." This document outlines the question that the food technologist and his marketing associates should ask themselves when they start to merchandise a new food product.

Food Quantities Rise In Reverse Lend-Lease

IN a report to Congress on reverse Lend-Lease aid from the British Commonwealth, President Roosevelt revealed that, as of June 1 Australia had provided 1,270,043,697 lb. of foodstuffs to our armed forces, while New Zealand has turned over 579,290,000 lb., and India 199,944,000 lb.

The Department of Agriculture reported on the same day that shipments of food and other agricultural products under direct Lend-Lease totaled 719,300,000 lb. during October. This was 177,000,000 lb., more than the September shipments, but was 400,000,000 lb. less than the shipments in October, 1943.

These babies may need your help

● In the next few years, these babies—and millions like them—may need your help so they may grow up to be strong and healthy. The thing all babies and growing children need to form strong bones and sound teeth is Vitamin D. The problem: where are they going to get it?

Unlike other vitamins and minerals needed for adequate nutrition, Vitamin D is not found in appreciable amounts in foods listed in the Government Food Charts. Sunshine, most common natural source, cannot be relied upon.

This presents a challenging situation before anyone connected with the food industry. It makes it possible for you to perform a distinct nutritional service in making Vitamin D universally available. And it opens up a new opportunity.

If your plans for future business expansion have not yet taken full shape, you might consider these two aspects of fortification of foods with Vitamin D: (1) food products, in general, are not as yet extensively fortified with Vitamin D; (2) a totally new direction is opened to many for product improvement.

If you are interested in the possibilities of Vitamin D in foods, we invite you to write for more complete information regarding Vitamin D (A.R.P.I. Process) and its use in your own particular food product.

Facts about Vitamin D

(A.R.P.I. Process)

Vitamin D (A.R.P.I. Process) is produced by activation of pure crystalline ergosterol with low velocity electrons. Biologically standardized, it is available in several concentrations (U.S.P. units of Vitamin D per gram), in two types of carriers. Requires no special incorporation equipment and does not impart taste or odor to any foods fortified by it. *Not under allocation. Readily available!*

GENERAL MILLS, INC.
Special Commodities Division
MINNEAPOLIS 15, MINNESOTA

Take the $$$$$$$ out of $tone$

• Now, with critical war shortage of labor, streamline STONING in your mill. Removing stones has always been slow, laborious and costly out of proportion to other steps in processing cereals, soy beans, and other dry foods. To eliminate this great headache of the cereal and other dry food processors, we have developed a new type stoner—revolutionary in design, amazing in efficiency, low in first cost, in operation. Removes stones, glass, non-magnetic metals, and all other hard, dangerous contaminations from cereals, soybeans, and other beans, and other food products, with, 1) an action so sensitive the tiniest particles are easily removed; and 2) operating cost so low it is relatively insignificant; and 3) 99.9% efficiency. Capacity up to 16 tons per hour. **Write for Bulletin FI-145.**

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DALLAS, TEXAS
In Canada—Kip Kelly, Ltd., 68 Higgins Ave., Winnipeg
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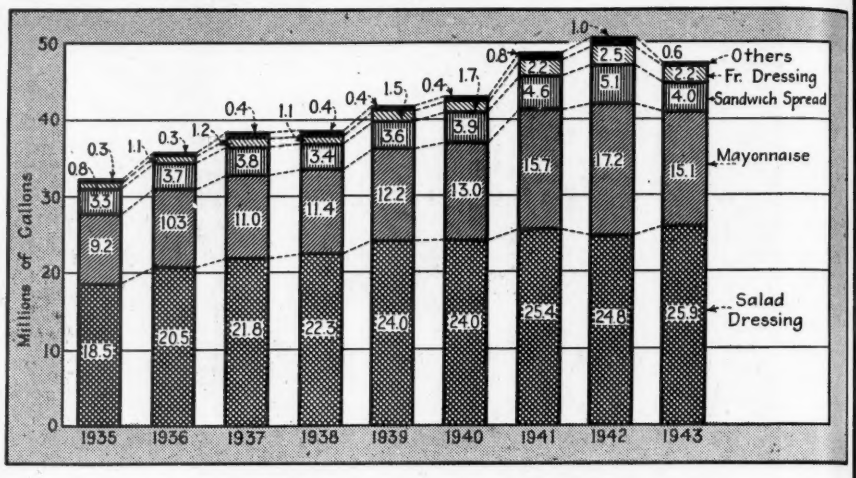
INDICATORS



Increase in salad dressing production, 1935-43.

Production

Meat production in 1945 is forecast at 22,750,000,000 lb., or about two billion pounds less than last year. Slaughter of cattle and calves is expected to be a million head higher. But pork production is likely to drop 22 to 25 percent, and the lamb output will be down considerably, American Meat Institute estimates.

Flour milled in November was about the same in quantity as in October, 1944, and November, 1943, according to *The Northwestern Miller.* November, 1944, production was 15,011,038 sacks, representing 73 percent of the total for the United States.

Frozen fishery products have shown a production increase of more than 250 percent since 1920. In that year the output was 92,260,000 lb., while the figure for 1943 was 246,053,000 lb.

Creamery butter production in October is placed at 100,135,000 lb., or 23 percent below the 1933-42 average for the month, and less than in the corresponding month of any year since 1925. Output declined 12 percent from September and 6 percent from October, 1943. Total production for the first ten months of 1944 was 1,312,425 lb., 12 percent less than in the same period of 1943.

American cheese made in October totaled 58,530,000 lb., up 13 percent from the figure for the same month of 1943 and 31 percent above the 1933-42 October average.

Sweet corn packed in 1944 amounted to 25,982,094 cases, as against 29,798,231 cases in 1943, National Canners Association reports.

Nonfat dry milk produced by the spray process totaled about 26 million pounds in 1944, or 10 percent more than during the preceding year. Since the set-aside for military use was less than previously, civilian supplies during 1944 were about 95 million pounds, or more than 2½ times the quantity available during 1943. Dry nonfat milk made by the roller process no longer is required for military use.

Sauerkraut packed from Sept. 1, 1943, to Sept. 1, 1944, in hermetically sealed containers and sterilized by heat totaled 2,198,942 cases, according to National Canners Association. This compares with 2,730,715 cases produced during the preceding year.

Edible gelatine manufactured in the first six months of 1944 totaled 14,974,000 lb., compared with 15,199,000 lb. for the same period of 1943.

CHANGE OF ADDRESS

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Director of Circulation:

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From .....

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To .....

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Signed .....

CONSTRUCTION NEWS

	Pending (thousands)	Awarded December (thousands)	Total Awarded 1944 (thousands)
Bakery	$ 214	....	$ 469
Beverages	140	....	260
Canning and Preserving	105	....	405
Cold Storage	1,190	$ 320	2,168
Confectionery	....	....	90
Grain Mill Products	465	....	1,800
Ice Manufactured	90	100	140
Meats and Meat Products	....	190	1,513
Milk Products	480	150	2,838
Miscellaneous	650	302	3,283
	$3,334	$1,062	$12,966

In Storage

The cold storage situation eased considerably in November, cooler occupancy dropping from 80 to 76 percent and freezer occupancy declining from 86 to 83 percent.

Apples in cold storage hit an all-time record in November as 35 million bushels moved into storage during the month.

Materials

Malt may be in tight supply in 1945, according to War Food Administration. Because less alcohol will be produced from molasses, requirements for malt will be greater, with no corresponding increase in malt production in prospect. If anticipated demands from distillers, brewers and food manufacturers materialize, malt requirements for 1945 will total 108,000,000 bu., as compared with an estimated supply of 100,000,000 bu.

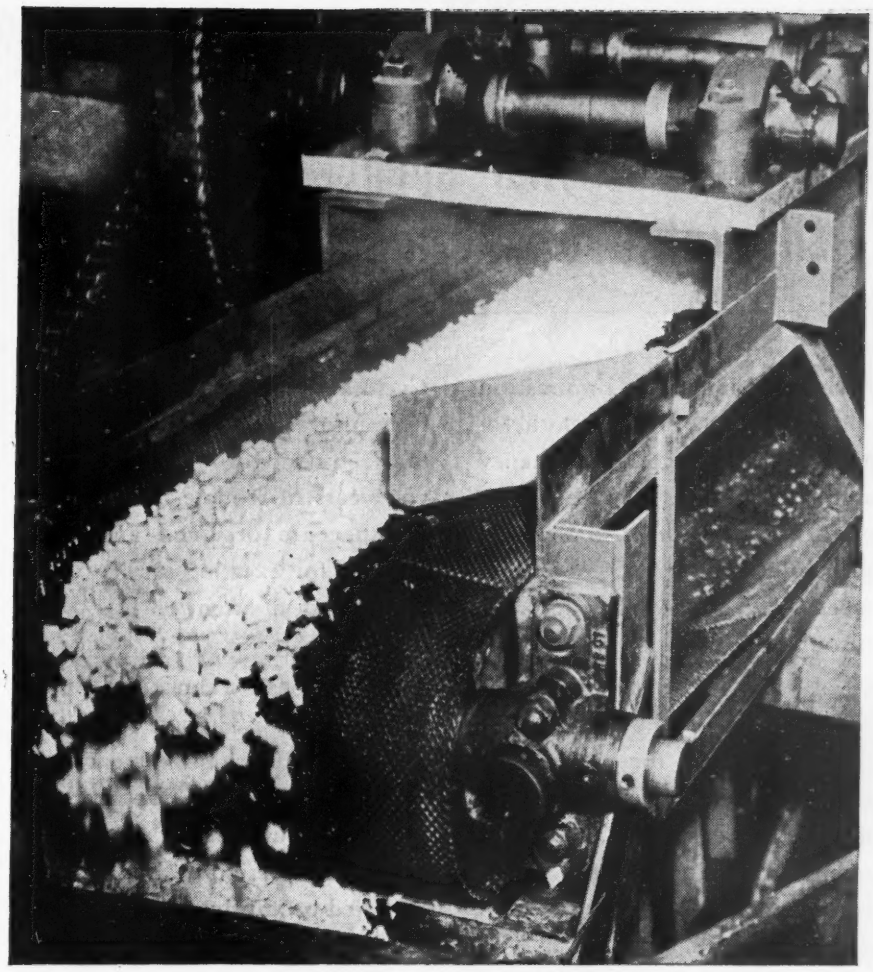
The peanut crop of 1944 was the biggest the country ever produced. From 5 million acres, the harvest was 2½ billion pounds, valued at $200 million, according to National Peanut Council. Between January and September, 1944, the Council estimates that 487,894,000 lb. of shelled peanuts went into edible channels in these proportions: In peanut confections, 110,265,044 lb.; salted, 151,247,140 lb.; in peanut butter, 213,697,573 lb.; for other purposes, 12,685,244 lb.

Indexes

Cost of living index of National Industrial Conference Board was up slightly to 105.2 in November. The October figure was 105.1 and that for November, 1943, 103.7.

Business activity index of *Business Week* stood at 231.3 for the week ending Dec. 16, a little above the 230.4 figure of a month earlier. A year ago the index was 238.1.

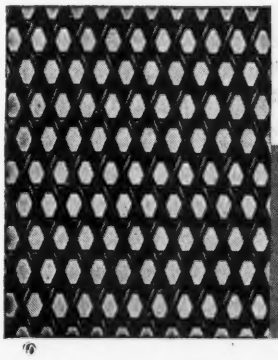
Wholesale price index for foods, compiled by Irving Fisher, was 123.7 on Dec. 15, as compared to 122.6 a year earlier.



Continuous, Self Unloading, Vegetable Blancher

Your "Ideal" Layout is Now Practical with METALWOVE BELTS

Today it's labor shortage. Tomorrow it may be profit shortage. There's always a reason for wishing you had machinery to do the work of hands. And by replacing your manual handling or batch processing operations with Metalwove Continuous Conveying and Processing Belts, you can make your wish come true. Result: Maximum production with minimum labor. Low Processing unit cost in a competitive market; therefore, more profits. Since all signs point to a continued demand for food way above our pre-war level, it behooves every manufacturer to lay plans as to what he will do, when our government permits him to buy the equipment he needs and wants. . . . Our engineers will gladly recommend the correct type and metal specifications of Metalwove Belt for every place you can use them. Then you can be ready to order the belts, without delay, whenever you are ready. Catalog on request.



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Subsidiary of Manganese Steel Forge Co.
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Representatives in Most Principal Cities

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Exclusive principles of combustion and design have given Cyclotherm an outstanding record of efficiency and economy among steam generators. Because of its combustion principles and design, Cyclotherm meets the dollar efficiency test throughout its wide power range (10 to 300 horsepower) in units that are both oil and gas fired.

Whether used for power, processing or heating, a Cyclotherm makes an enviable record in steam production per unit of fuel consumed.

Cyclotherm Steam Generators are fully automatic, strongly built and fully self contained. They will give you years of trouble-free service for they are designed and constructed for exacting service with a minimum of attention.

While the range of available units obviously cannot be on a peacetime basis, if you are planning immediate replacement, our engineers will gladly cooperate in meeting your needs. Any additional information desired will be supplied promptly.

100 horsepower Cyclotherm with electronic control

CYCLOTHERM
STEAM GENERATOR

AMES IRON WORKS
OSWEGO . . NEW YORK . . BOX 601

OPA Orders

Citrus Juice—Taking into consideration the estimated reduction in yield caused by the October hurricane in Florida, the average grower prices for oranges, to be used in constructing canners' ceiling prices for the 1944-45 pack of canned single-strength orange juice and blended orange and grapefruit juice, will be $47.55 per ton for Florida and $41.55 for Texas, according to a joint OPA and WFA announcement, issued December 4.

Processed Foods—Food processors, who price their products under Price Method No. 1 to Supp. 7, FPR 1, are required to file a statement of their maximum prices, on OPA Form 633—2100, within 30 days after the start of all packs begun after December 6, by Amendment 17 to the above regulation and supplement. The statement should be filed in duplicate with the OPA district office serving in the area in which the processors' principal place of business is located.

Cheese — Ceiling prices on Italian, Swiss, brick and Munster cheese are increased at the factory level by ½ cent per pound for the last two, 2 cents per pound for Swiss, and from 2 to over 6 cents per pound for Italian, by amendments 15, 16 and 17 to RMPR 289, effective December 4 and 7.

Beans—Amendment 1 to Supp. 2 to FPR 1 permits individual adjustment of a bean processor's maximum price, if his price is below the median price at which sales of the specific grade are made by processors in the general area. The adjusted price may not exceed this median, however.

Sausage—By way of correcting an inadvertent exclusion in the sausage regulation, Amendment 16 to MPR 389 permits sausage makers to use pieces of beef, calf, pork, lamb or mutton tongues in such products as tongue roll or tongue loaf.

Wheat—The ceiling price of wheat is increased by 4 cents a bushel by Amendment 4 to RMPR 487, effective December 13. The prices established by this amendment are calculated to reflect parity to producers.

Minor Packs — Grower-processors of minor packed fruits, berries and vegetables are given a formula, through Amendment 18 to Supp. 7 to FPR 1, by which they can figure their ceiling prices. This formula replaces the regulation under Pricing Method 2, whereby the processor had to apply to OPA for specific authorization of a maximum price for each item.

Cranberries—Processors of cranberries may reflect an increased raw material

cost of $22.38 per 100 lb. in their ceiling prices for packed cranberries, according to Amendment 16 to Supp. 7 to FPR 1.

Raw Materials — Growers' maximum prices for "cooperative contract" sales of fresh fruits, berries and vegetables to processors are now that proportion of the processor's selling price for the processed product that he received under the last cooperative contract he entered into prior to April 28, 1942. The action under Amendment 11 to MPR 425 is effective November 20, and is also effective as of July 5, 1943, for preexisting contracts.

WFA Orders

Bread—All restrictions on the packaging of bread and rolls, are removed from WFO 1, by Amendment 12, effective December 4. Bakers are still subject to WPB Order M-351, however.

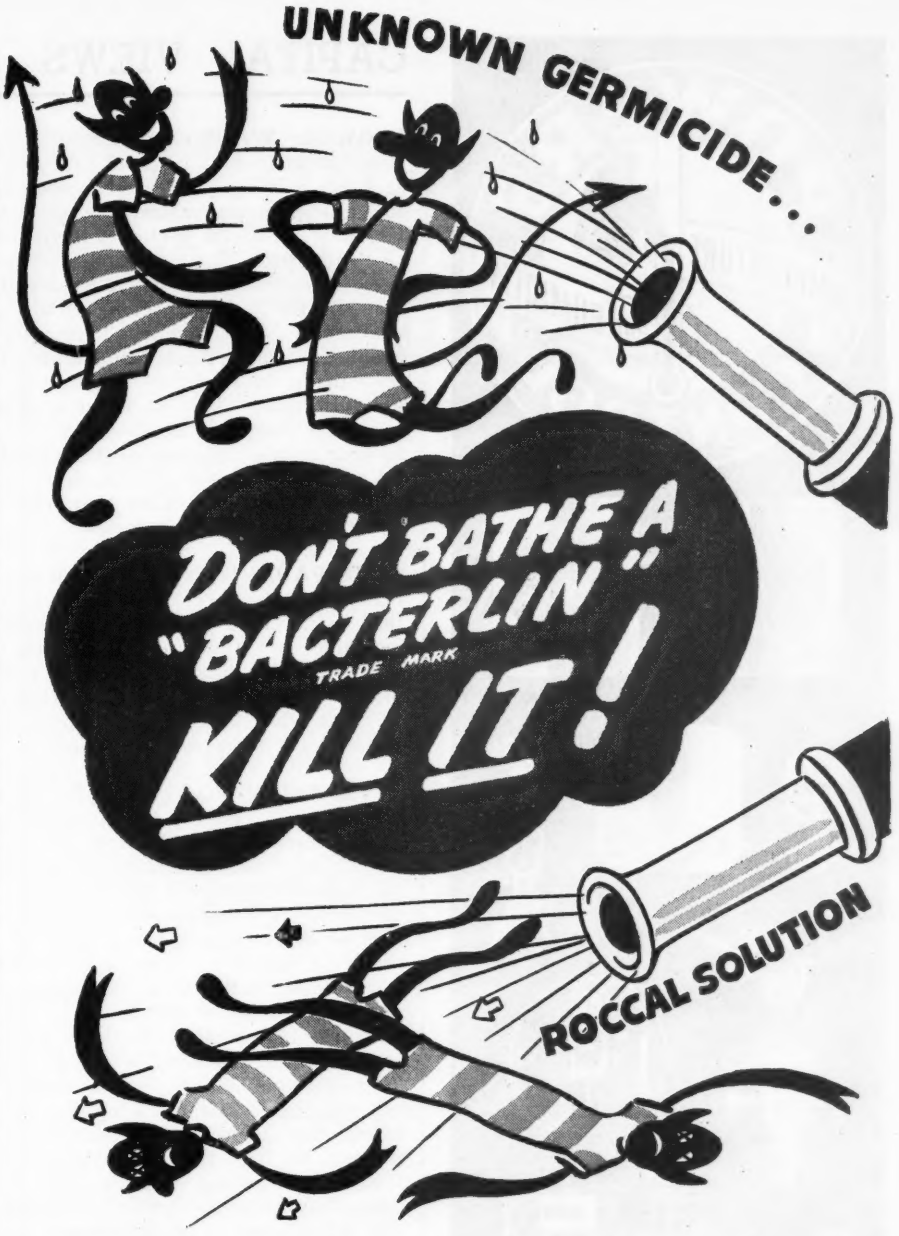
Pork—Amendment 4 to WFO 75.3 increases the set-aside percentage of frozen pork sides from 4 to 4.5 percent; loins are increased from 3 to 3.5 percent; hams, from 4.5 to 5 percent and fat cuts from 1.5 to 2.5 percent. The quantity of hams to be prepared for the army overseas is increased from 20 to 30 percent.

Beef—A new definition of "Army style beef" is promulgated by Amendment 17 to WFO 75.2, effective December 3. The change appears in the reduction of the minimum weight of carcasses by 50 lb. in several cases.

Amendment 16 to the same order requires that all slaughtering plants where more than 51 cattle that produce army style beef are slaughtered weekly, must now be included in the set-aside order. Heretofore, any number of persons were allowed to slaughter at a plant and no set-aside was required so long as the individual slaughterer did not exceed the 51 head minimum.

Grapefruit — Production of frozen grapefruit segments are discontinued by WFO 118, effective November 29, which requires the processor's entire production to be in canned form. Government agencies will get almost the entire production under WFO 22.7.

Grapefruit Juice—Unless approval is given by WFA, no subsidy will be paid to canners on grapefruit juice produced from fruit delivered on a provisional contract in which the exact purchase price is not determined prior to or at the time the fruit is delivered. This provision does not apply to deliveries made before November 19 under this type of contract. WFO 22.7 requires that 39 percent of the 1943-44 or the entire 1944-45 pack, whichever is lowest, be set aside for government agencies.



ROCCAL—Highly effective germicide for general disinfection, ***kills bacteria.*** In effective concentrations, it is non-poisonous and imparts no taste or odor to foods.

ROCCAL—Is of particular value as a sanitizing agent for the disinfection of equipment used in all food industries.

ROCCAL—Contains no chlorine, phenol, iodine or heavy metals.

ROCCAL—Is economical—effective *even in cold solutions.*

ROCCAL—Is non-corrosive . . . does not injure fabrics, metals or rubber.

ROCCAL—Is non-irritating to operator's hands when used in proper dilutions.

ROCCAL—Is stable . . . maintains its high germicidal properties over long periods . . . does not deteriorate in storage.

FOR DETAILED INFORMATION about the uses of ROCCAL in overcoming bacteria, molds, slimes and other harmful organisms in your plant, *write today.*

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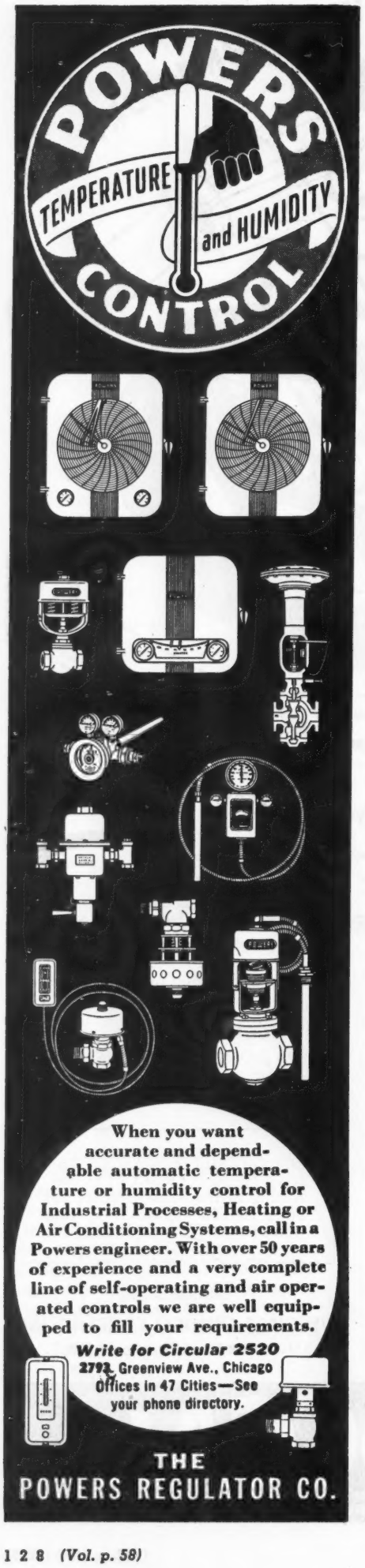
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CAPITAL VIEWS

HIGHER WAGE RATES—Calculating factory costs on food this year probably will compel the technologists to use higher wage rates than applied last year. Several factors contribute to this result. Not the least of these is the reelection of President Roosevelt through the aid of organized labor, which now has a "mandate" from the people to support its campaigns—at least that's the way they tell it. Congress is rather likely to enact a new minimum wage rate of about 60 cents an hour to take the place of the present "Wage-Hour Law," which fixes a 40-cent minimum. This will pinch badly in many food factories.

SAVE PAPER!—Paper and pulp containers will be more scarce this year than last. This gives the maximum incentive for stimulating waste-paper salvage. Food manufacturers can well organize or promote local campaigns so that they may get some raw material for their own business.

GIVE AWAY FOOD—Surplus food may be given away by the government soon after VE-Day. War Food Administration seems unable to decide on any other program for disposal of certain kinds of food surplus. A glorified food-stamp plan is still talked. The result of any such plan will not be to increase total food consumption very much. But it will increase consumption of the more expensive processed foods at the expense of low cost, "fat back and grits," just to mention one regional example. The long-term result may be the development of a demand for higher types of food from the food processing industry. But the immediate effect is certain to include the disturbance of many normal distribution programs.

ENOUGH WATER?—Geologists are disturbed about the shrinkage of water supply of good quality in certain parts of the country. In some cases, groundwater levels have declined. In other cases, the trouble is principally a large increase in industrial water consumption. Food plants are so dependent on plenty of water that this is one of the questions which smart food technologists constantly watch. And even more important, it is a subject to receive serious study if a new plant location is being considered.

BACK TO METAL—Many foods can be packed in metal again quite soon. Some very important new containers may be available—some made of aluminum, for example. About the only scarce metal, as Washington now views the early future, is tin. As paper is very scarce, there will be a trend back to metal containers this year. But the movement should be restricted by the knowledge that tinned containers will not be overabundant even in the early postwar period.

CRISIS THEME SONG—When the Administration gets ready to drive a batch of new bills through Congress against opposition, they always synthesize some sort of a crisis as the reason for urgency of action. It looks now as though rebuilding of soil fertility might be a new crisis maker. Quite a number of government executives are shouting about the need for rebuilding the fertility of America's soil so that we may be ready for the next war. The early objective of this "blah" seems to be the desire to get more complete control of agriculture as a source of food raw materials. This is not so good.

BAD EGGS—WFA executives must hear the hen's cackling in their sleep. They had a big egg surplus problem to handle last summer. Even by desperate measures they were unable to reduce flocks as much as desired. The price-support program required by law now will compel further big egg purchases by the government. This will clutter the warehouses and cause innumerable troubles for egg-using industries and for industries whose products compete with eggs.

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The situation is so bad that giving away dried eggs is seriously considered by Washington as the only way to offset the present problem. There is no hope of having the price of processed eggs or shell eggs reduced so that folks might economically use more of them. The economics of the situation smells worse than the least desirable quality of eggs involved.

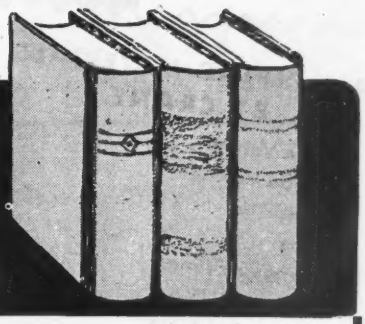
PROTECTING BRANDS—The government is going to sell a lot of foods as they become surplus from time to time. Some of these will be branded goods, and many more items will carry manufacturers' names. Generally, the person who produced the goods has a preference in repurchase from the government. The purpose of that preference is to permit the manufacturer to control final public distribution in order to protect his brands and his company name. In some cases, the quality will differ from that of the usual commercial goods. In such cases it will be particularly important for the manufacturer to take advantage of his privilege and buy in the supplies for resale. It will be very unfortunate if resale of old goods of this sort should cause ultimate purchasers to think unfavorably of reputable manufacturers. The government generally will cooperate in avoiding that contingency.

NEW EXPORTERS—A great many manufacturers are thinking of the export market as an outlet for those goods which exceed the supply which they can sell in the United States. Such prospective exporters have a great deal to learn before they can become successful. They must study the special technic of packaging, the requirements for labeling, the special means of transportation and insurance, and, of course, the credit and trade standing of their foreign customers.

COMMODITY MINDED—Reorganization of the State Department suggests that Uncle Sam is going to give more attention to international business. That is fortunate. Friction between two countries in a political and military sense usually follows an inability of the two countries to get along in business.

CONTAMINATION—Closer control of the quality of processed food is now both necessary and possible. Microscopic control of many products is now as much an everyday necessity as is chemical analysis. Contamination by filth, insects or decomposed portions of raw material cannot always be detected adequately without micro-analysis. If a plant cannot furnish this service for itself, it must look about and find advisory skills to help among the laboratories and consultants available. The inspectors look at raw products through a microscope. Our own laboratories better do likewise.

REINHOLD BOOKS on FOOD and NUTRITION



DRYING AND DEHYDRATION OF FOODS
By H. W. von Loesecke

Describes the types of equipment used in drying and dehydrating vegetables, meat, fish and dairy products. Included also are specific figures for moisture content, yield, processing losses and drying temperatures, plant sanitation, factory cost, packaging, storage, and the nutritional value of these foods with special reference to vitamin content and taste.

302 Pages Illustrated $4.25

OUTLINES OF FOOD TECHNOLOGY
By Harry W. von Loesecke

Discusses explicitly the subject of canning, comparing tins with glass; also in detail, dehydration; the addition of vitamins to flour; the increasing production of beet sugar, domestic wines and cheeses, and frozen foods.

504 Pages Illustrated $7.00

VEGETABLE FATS AND OILS
The Chemistry, Production and Utilization of Vegetable Fats and Oils for Edible, Medicinal and Technical Purposes—Second Edition.

By George S. Jamieson

Discusses sources of these products; processes of preparing, clarifying, extracting, bleaching, refining, and all other treatments. Information exhaustively documented.

508 Pages A.C.S. Monograph #58 $6.75

FATS AND OILS—An Outline of Their Chemistry and Technology
By H. G. Kirschenbauer

Offers to those practically engaged in the food industry a condensed treatment of the fundamentals of the chemistry and technology of vegetable fats and oils. Covers the nature, methods of processing, chemical structure, and divers uses of both animal and vegetable oils and fats.

154 Pages Illustrated $2.75

WHAT ARE THE VITAMINS?
By Walter H. Eddy

An authentic, scientific presentation of facts, giving complete and reliable information about every phase of vitamins, their properties, functions and values in the diet.

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MINERALS IN NUTRITION
By Z. T. Wirtschafter, M.D.

For all who wish to understand the basic requirements of an adquate diet. It explains in simple terms the importance of milk, water and salt in the diet, and the necessity for calcium and phosphorus. The complete tables of the mineral content of common foodstuffs are of great service to meal-planners.

175 Pages Illustrated $1.75

MARINE PRODUCTS OF COMMERCE
—Their Acquisition, Handling, Biological Aspects and the Science and Technology of Their Preparation and Preservation

By Donald K. Tressler

Contains many things of interest to the specialist in these lines as well as to the general reader. The information in it is of great value to all identified with the commercial side of marine products.

760 Pages Illustrated $12.00

BIOCHEMISTRY OF THE FATTY ACIDS AND THEIR COMPOUNDS, THE LIPIDS
By W. R. Bloor

Discusses the part played by fats and lipids in digestion and nutrition, and the relation of fatty acid metabolism to such pertinent subjects as vitamins, enzymes, the reproductive cycle, embolism, anaemia, cancer, diabetes, syphilis, arthritis, and others.

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A.C.S. Monograph #93

OUTLINES OF THE AMINO ACIDS AND PROTEINS
Edited by Melville Sahyun

Offers to nutrition workers a fundamental appreciation of the properties and functions of the vital substances and bodily processes essential to the maintenance of life and health. Twelve authorities under the editorship of Dr. Sahyun have produced this comprehensive, practical review of the field.

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Second Edition
By Francis F. Heyroth

This comprehensive volume, three times larger than the first edition, presents a vast amount of information on all phases of ultra-violet irradiation. Subjects covered include: canning of foods, sterilization, irradiation of milk and fruit juices, tenderizing of meat, irradiation therapy in treatment of rickets.

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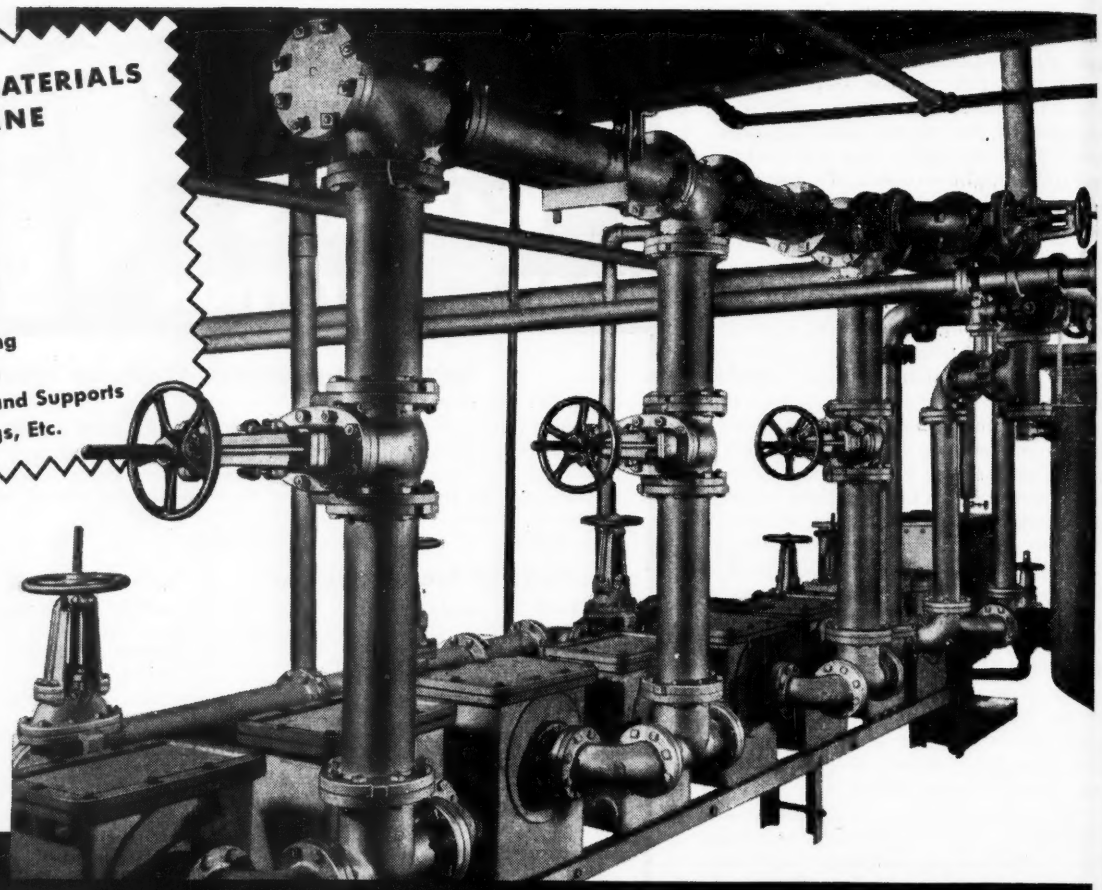

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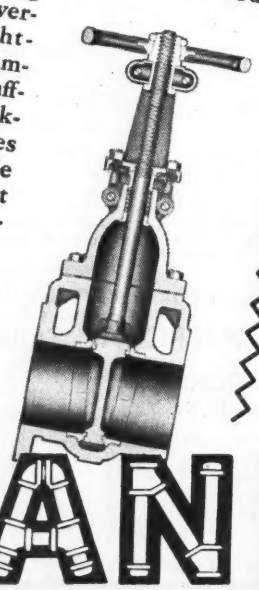

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INDUSTRY

Capital Stockyards, Inc., has broken ground on its new plant at Montgomery, Ala. H. L. Vandigriff is president of this $250,000 concern, and L. C. Henley, vice-president and general manager.

Figco Co., Los Angeles, cereal beverage manufacturers, has been purchased by Ballif Distributing Co., of Portland, Ore. H. T. Davis, former Union Oil Co. executive, will be in charge of the plant.

J. J. Gielow & Sons, Inc., Detroit, manufacturers of preserves, pickles and other foods, has been granted permission by WPB to construct a new concrete masonry plant building to cost close to $300,000.

H. J. Heinz Co. is equipping its plant at Fremont, Ohio for the production of dehydrated beets for the government, following conclusion of the season's campaign on tomato products.

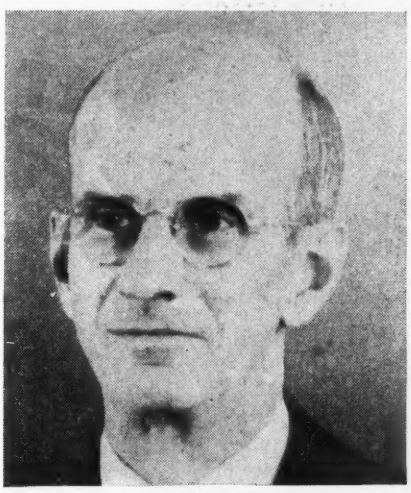
Kuehmann Potato Chip Co., Toledo, has purchased 43 acres of vacant land served by two railroads, where it will build a potato warehouse. Post-war plans call for centralization of all the company's operations on the property.

Ohio Farm Bureau Federation adopted a resolution, at its recent 20th annual convention, endorsing grade labeling as "necessary to efficient consumer purchasing as well as a protection against fraud." The group further voted to urge legislation to make grade labeling universally mandatory.

Quaker Oats Co. has purchased a tract of land in Greenwood, Miss., on which a grain elevator will be erected. The erection of the building will begin immediately and it is hoped to have the plant ready by next spring.

Kraft Cheese Co. is making plans for a broad expansion program. Arthur J. Riddle, vice-president and manager of national bulk cheese production, announced that production facilities will be under way soon at Marshall, Ind., Clare, Mich., and Decatur, Ind.

San Diego Packing Co., San Diego, Calif., will build a new modern tuna fish cannery at a cost of $250,000. Officers of the company are E. M Darrimon, president, and G. W. Repetti, vice-president The plant will have a 1000-ton refrigerated storage space for holding fish.



JOHN CLARK BAKER

The American Association of Cereal Chemists will award the Osborn Medal to Dr. John Clark Baker, for distinguished contributions to cereal chemistry and related sciences. This medal is the highest award presented by the association and is given once in several year intervals.

HARVEY P. HOOD

The International Association of Ice Cream Manufacturers recently elected Harvey P. Hood as its president. As a leading member of the dairy industry in Boston, Mr. Hood is considered well equipped to carry on the policies of the association, whose headquarters are in Washington.

Spencer-Kellogg Co. and Kellogg & Sons, Inc., Buffalo, will build a large solvent plant to extract oil from soybeans at Bellevue, Ohio. The cost of the project will be approximately $2,000,000, and will be built on a 27-acre plot. Among buildings planned are storage units with space to store 2,500,000 bu. of soybeans.

Sun Harbor Packing Co., San Diego, has leased a small section of tidelands adjacent to its plant for the construction of a refrigerator plant, according to a recent announcement by Jack Crivello, president. He reported that the fish cannery is negotiating for increased rail facilities.

EVERETT A. WILSHER

Election of Everett A. Wilsher as executive vice-president and his appointment as general manager of Michigan Bakeries, Inc., was recently announced in Grand Rapids, by the company's president, Percy Owen.

United Biscuit Co., Chicago, has acquired control of the MacSim Bar Paper Co., Otsego, Mich., to give the company an assured supply of paperboard for biscuit cartons.

PERSONNEL

William F. Allen becomes director of research development of the A. E. Staley Manufacturing Co., Decatur, Ill., replacing Dr. K. J. Seulke, who is leaving to go in business for himself.

Frank M. Archer has submitted his resignation as vice-president and general manager of the Moxie Co. He has been connected with the Moxie Co. for 24 years and plans to retire from active business.

Fred B. Bain recently was elected chairman of the board of the Leslie Salt Co. and C. M. McDaniel, formerly sales manager, is now executive vice-president.

Ensign William G. Burkhardt, of the Navy, who has been executive vice-president of Burkhardt Brewing Co., Akron, Ohio, was recently elected president, succeeding his late uncle, Gus F. Burkhardt. G. Carl Dietz, treasurer, was elected vice-president.

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Retaining corrosion resistance requires skill and long experience. S. Blickman, Inc. has specialized for years in fabricating processing equipment of stainless steel and other corrosion resistant alloys. We have established production techniques and factory controls—checked by engineers and aided by specialized machinery—to guard alloys in fabrication. When you require new processing equipment, consult with us.

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WALLACE MONTGOMERY
G. Washington Coffee Refining Co., recently elected Wallace Montgomery as vice-president in charge of production. Mr. Montgomery has been with this subsidiary of American Home Foods since 1927.

Henry L. Cox has been appointed general manager of the Chemical Division of Corn Products Refining Co., Argo, Ill.

Alfred Warner Eames, president of the California Packing Corp. since 1940, was recently appointed to the board of directors of the Santa Fe Railway.

Robert H. Fletcher has been elected president of the Central Soya Co., Inc., Fort Wayne, Ind., to succeed Dale W. McMillen, Sr., who remains as chairman of the board. Mr. Fletcher had been assistant to the president and general attorney for the firm.

Wesley Hardenbergh, president of the American Meat Institute, Chicago, has been elected president of the American Trade Association Executives.

A. P. Hower has been named Detroit district manager for Best Foods, Inc. He was formerly a wholesale salesman for the firm.

Ware Hutcheson, who for the past several years served as Southeastern Regional Sugar Rationing Representative of the OPA, recently resigned and opened an office in Atlanta, Ga. He is representing Ball Brothers Co., Muncie, Ind., and the Aridor Co., Chicago.

Mary Kinnavey Moore has joined the American Institute of Baking as food publicist. Mrs. Moore will prepare AIB copy for the press and radio.

Emil M. Mrak, of the Food Technology Department, University of California, is serving as a consultant to the War Department, working in the office of the Quartermaster General under Colonel Isker. He expects to be in Washington for several months.

Charles J. Regan, formerly manager of the Omaha plant of the Schulze di-

It pays to be a Bemis Multiwall paper bag Customer

EVEN though direct government purchases have taken a considerable part of our multiwall paper bag production this year, Bemis customers have not suffered . . . they have been supplied on the basis of past purchases, even in the face of the labor shortage and no increase in facilities.

Naturally, the demand for Multiwalls has been greater than the supply. Much as we regret inability to fill all orders, we have felt a responsibility to take care of our regular customers first. Fortunately, we've been able to do that—and right on schedule. If it's humanly possible, we'll keep on maintaining this service.

War or peace, we want our customers to feel that it pays to be Bemis customers.

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A major reason we've been able to supply our Multiwall customers is the size and flexibility of our production facilities.

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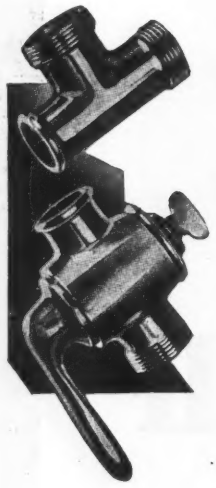

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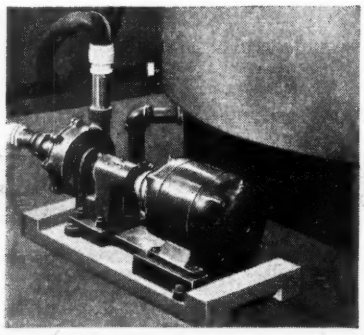

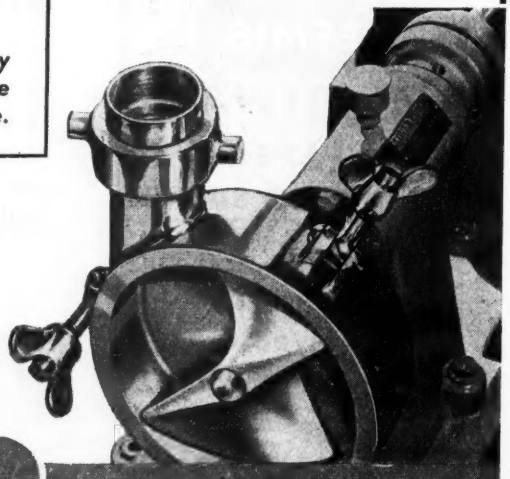

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vision of Interstate Bakeries Corp., ha been transferred to Chicago to succee Claude W. Cable. Mr. Cable was mad assistant to the general manager of th Schulze division with headquarters i Kansas City. Harry E. Meyn replace Mr. Regan as manager of the Omah plant.

J. E. Skidmore has been named presi dent of the central division of Genera Mills, Inc., with headquarters in Chi cago, succeeding H. R. McLaughlin, re tired. Mr. Skidmore was previously ex ecutive vice-president of the division.

Charles C. Teague, Ventura County lemon grower, recently was reelected president of the California Fruit Grow ers Exchange, which he has headed for 24 years. Harvey A. Lynn, of Riverside LeRoy E. Lyon, of Orange, and J. A Moffet, of Lemon Cove, were elected vice-presidents.

Leo J. Walsh has been appointed man ager for General Mills vitamin product sales, and will take over the New York offices of the company's Special Com modities Division, assuming the duties formerly assigned to Frank Dowe, Jr. Mr. Dowe resigned recently to become sales manager of vitamin products for Distillation Products, Inc., owned jointly by General Mills, Inc., and Eastman Kodak Co.

DEATHS

A. Benatti, 66, manager of the Lucc Olive Co., Exeter, Calif., Nov. 11.

Eliot H. Chamberlain, 86, retired treasurer of the F. B. Chamberlain Co. food product manufacturers, Nov. 20 St. Louis.

John C. Fischer, secretary of the Ideal Pure Milk Co., Evansville, Ind. for 37 years, Nov. 23.

Mrs. Anne Gertrude Kavanagh, 55 originator and owner of Mrs. Kava nagh's English Muffins, recently, in Hingham, Mass.

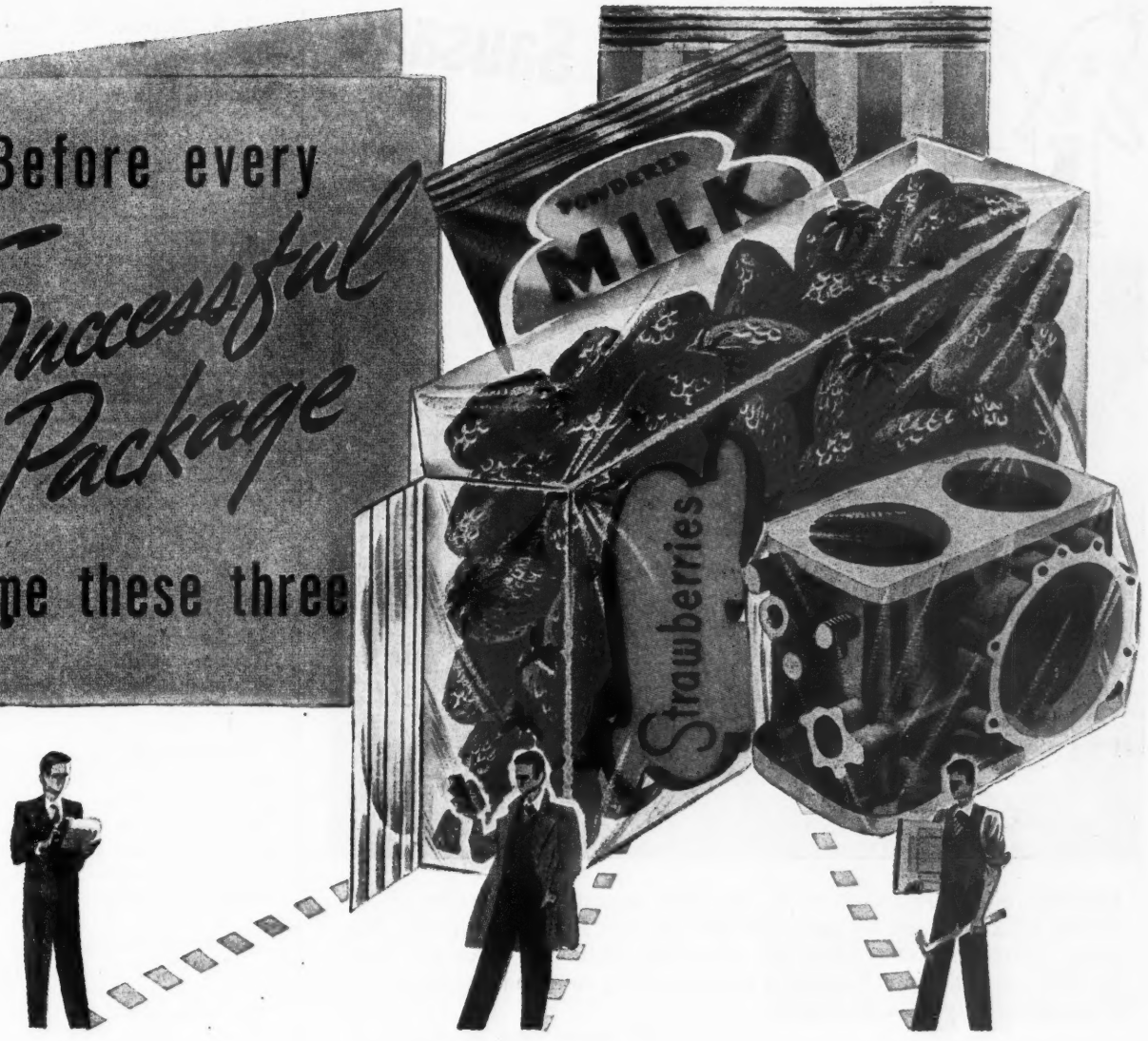
Harry Lavin, 75, founder and chair man of the board of directors of the Sugardale Provision Co., Canton, Ohio Nov. 26, in Miami Beach, Fla.

Fred Matalone, 61, president of the Chicago Macaroni Co., Dec. 3, in Chi cago.

William Peck McCaffray, 64, presi dent of the National Fruit Canning Co. Seattle, and director of Northwest Can ners' Association, Nov. 30, in Seattle.

William D. LeBar, 54, general super intendent of the Pennsylvania Salt Man ufacturing Co., Nov. 21, in Wyandotte Mich.

Before every *Successful Package* come these three



THE TECHNICIAN

First, Shellmar technicians visit your plant and make a personal study of your packaging, handling and production problems.

THE ENGINEER

Second, Shellmar engineers submit your product to extensive laboratory testing in conjunction with various functional materials.

THE DESIGNER

Third, Shellmar package designers create a colorful and eye-appealing design to insure maximum attention to the product.

Only the combined knowledge and skill of these three packaging experts can assure your product a truly successful package. Although our actual production is still largely devoted to war Shellmar's staff of technicians, engineers and designers are ready to work with you now.

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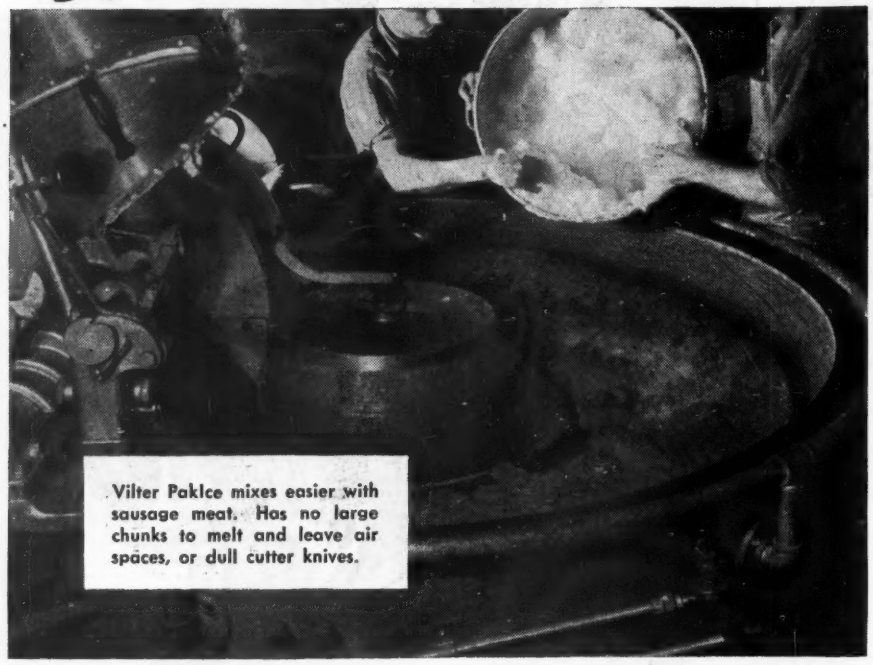
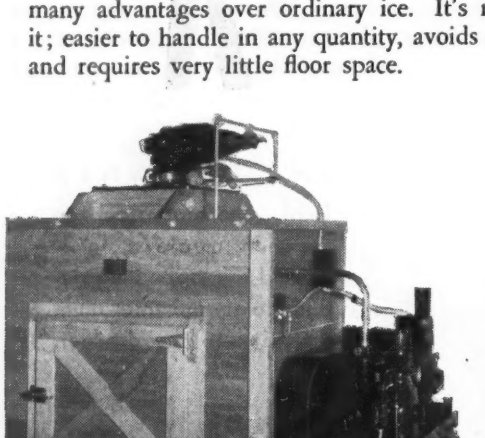
Make Better Sausage

with VILTER PAKICE equipment...



Vilter PakIce mixes easier with sausage meat. Has no large chunks to melt and leave air spaces, or dull cutter knives.

Crystalform PakIce, produced in your plant at costs as low as $1.50 per ton, in capacities from ½ ton to 30 tons per day from a *single unit,* has many advantages over ordinary ice. It's ready where and when you need it; easier to handle in any quantity, avoids crushing costs and meltage losses, and requires very little floor space.



Vilter 1-ton self-contained PakIcer. Other models available in daily capacities from ½ ton to 30 tons in 5-ton increments — to fit all needs.

But even more important to sausage makers — PakIce has no large chunks to melt and leave air spaces when mixed with meat, and that means better sausage. Cutter knives last longer, too, for PakIce, soft as snow, has no hard lumps to dull knives.

Meat packers and sausage makers everywhere have cut their ice costs as much as 50% and more with Vilter PakIce. This one factor alone will pay for a Vilter PakIcer in your plant.

Superior Since 1867 VILTER Air Conditioning Refrigeration...

Write for the MONEY-SAVING FACTS on Vilter PakIce Equipment!

ARMY E NAVY

The VILTER MANUFACTURING CO.

2118 South First Street • Milwaukee 7, Wisconsin

Offices in Principal Cities

J. S. Morrow, 95, formerly general manager of Libby, McNeill & Libby's California Fruit Division, Oct. 27, in Alameda, Calif.

Edward L. Muckerman, president Sieloff Packing Co., Nov. 6 in St. Louis.

Frederick L. Palmer, 67, secretary and treasurer of the Wesson Oil and Snowdrift Co., Inc., Nov. 20, in New Orleans.

ASSOCIATED INDUSTRIES

Brown Instrument Co. has appointed O. B. Wilson as its New York industrial manager, effective the first of the year.

Continental Can Co. recently announced the appointment of R. V. Wilson as director of customer service, succeeding L. F. Pratt, who has resigned to take a position with Hunt Bros. of Hayward, Calif. Mr. Wilson joined Continental in 1928, specializing in solder and flux research.

Food Machinery Corp. announces the appointment of William de Back as vice-president and a member of the executive committee. Mr. de Back is well known in the food field as a former vice-president and general manager of Chisholm-Ryder Co., Niagara Falls.

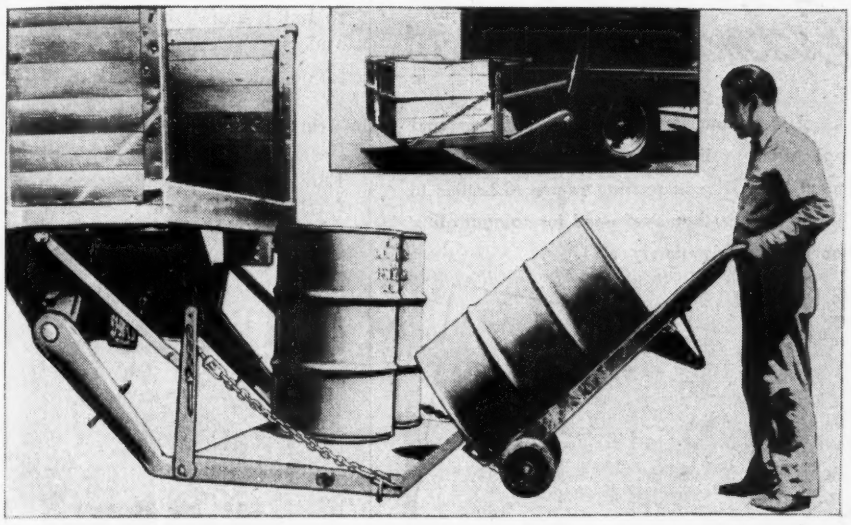
Creamery Package Mfg. Co. has appointed Carey K. Tally as manager of the Los Angeles Branch. Mr. Tally has been with the company for nearly 17 years.

Fritzsche Bros., Inc., has realigned its executive personnel following the death, in October, of George L. Ringel, a director and vice-president. John H. Montgomery, secretary and a director, has been elected second vice-president, retaining also his former office. Hans P. Wesemann, third vice-president, has been made a director and Joseph A. Huisking, fifth vice-president, has been elected treasurer and managing director of the company's affiliate, Fritzsche Brothers of Canada, Ltd. A new position was created, that of chief chemist, and Dr. Ernest Guenther, fourth vice-president, was appointed to that post.

Taylor Instrument Cos., Rochester, N. Y., has appointed Raymond E. Olson, manager of the sales engineering department, to the board of directors. M. Herbert Eisenhart, president of Bausch & Lomb Optical Co., received a similar appointment.

The J. A. Zurn Manufacturing Co., Erie, Pa., announces the appointment of Robert H. Shenk as administrative engineer in charge of research and development of the Zurn line of fluid-handling equipment.

FOOD EQUIPMENT NEWS



Power-loading endgate.

Elevating Endgate

POWER loading is achieved on trucks and truck-trailers by means of an elevating endgate now made available nationwide by Fruehauf Trailer Co., 1235 Lafayette Bldg., Detroit 26, Mich., following successful use on the West Coast. The endgate is a steel tail-gate which acts as an elevator, and it can be installed in place of the ordinary endgate. The new elevating endgate is hydraulically driven by power from the truck engine and is controlled by levers at the rear of the vehicle.

Dowtherm Process Tank

INDIRECTLY heated processing tanks and kettles using Dowtherm E as a heat transfer medium are announced by Castaloy Corp., 197 So. Waterman Ave., Detroit 17, Mich. Either gas or electricity is used as the source of heat.

Indirect heating is accomplished by enclosing the processing container within a considerably larger vessel which contains the Dowtherm E. The two tanks form an integral welded, leakproof, hermetically sealed construction.

Dowtherm E boils at 350 deg. F., and at 390 deg. F. the vapor pressure is approximately 101 lb. By controlling the vapor pressure, the temperature in the processing tank is maintained within very close limits. Control is by means of thermostats.

The tanks are constructed of heavy plate steel, stay-bolted to withstand any required pressure. They are well insulated with fiber glass which, together with the positive heat control, insures economical operation.

A direct-heating type also is available, and is similarly insulated and controlled by means of thermostats mounted on each unit.

Both the direct and indirect heating units are made in round or rectangular shapes to meet particular needs.

Flame-Proof Paint

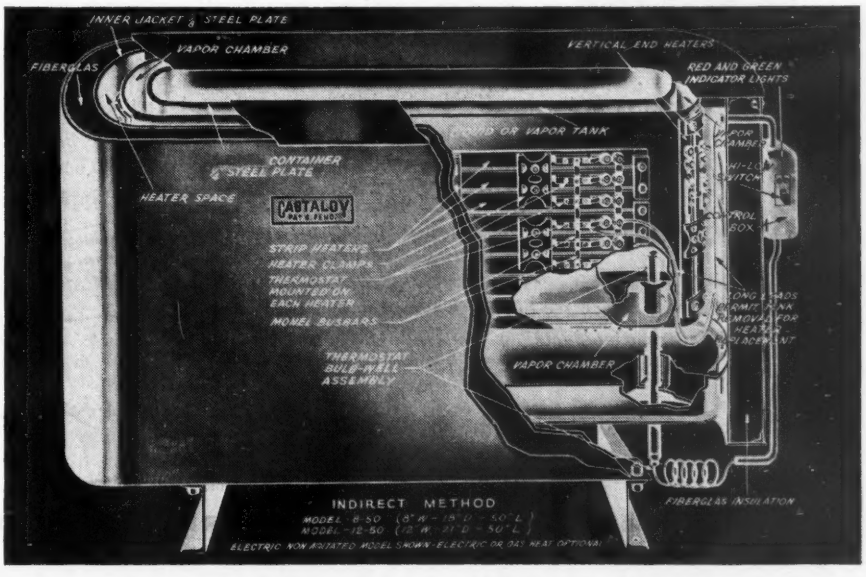
BRILLIANT metallic flame-proof paint with rust-preventive features for extremely hot surfaces is produced by Wilbur & Williams Co., Boston, Mass. It is said to stand up to 1,800 deg. F., to be nonburnable, and to be applicable to either cold or hot surfaces.

Metal Detector

DESIGNED to detect and indicate the presence of tramp iron or steel in materials such as food products is a metal detector produced by the Illinois Testing Laboratories, Inc., 420 N. La Salle St., Chicago 10. The detector consists of a search coil, amplifier and supervisory signals. A microcontrol permits easy adjustment of sensitivity. It is stated that the detector can be arranged for continuous flow of material or periodic flow with manual control.

Metal detector.

The size of the metal piece which the system is able to detect depends upon the speed of flow through the search coils and the relative size of the search area. Each unit is built to order to



Indirect heating processing tank containing Dowtherm E.

Food is VITAL!

Reduce waste with *Beckman* pH Control

Among the many ways that Beckman pH Control is cutting lost time, saving money and reducing waste in food operations is its application to increasing the effectiveness of bottle washing, sterilizing of processing equipment, etc. The increasing re-use of bottles to conserve glass and metal supplies, coupled with the greater-than-ever need for safeguarding public health, makes this Beckman application particularly timely . . .

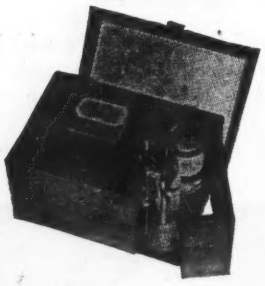
pH APPLICATIONS

BAKING
BOTTLE WASHING
BREWING
CANNING
CARBONATED BEVERAGES
CASEIN PRODUCTS
CHEESE MAKING
FOOD LABORATORIES
FRUIT JUICES
GELATIN PRODUCTS
JELLY MAKING
MALTING
PHARMACEUTICALS
SALAD DRESSING
SUGAR REFINING
VITAMIN PRODUCTS

STERILIZING

Bacteria are very sensitive to changes in pH, thriving in an environment of neutral pH and becoming decreasingly active as the pH is lowered. By utilizing this fact a more complete "kill" of micro-organisms can be obtained by performing the washing and sterilizing operations at a low pH. A low pH (4 or under) is particularly important when using the detergents and similar cleansing agents so widely employed today, as well as with standard soap solutions.

Without accurate pH control sterilization may be incomplete and haphazard. But with it, a more uniform and completely effective germ "kill" can be maintained at all times. Spoilage and waste are minimized. Quality and flavor are safeguarded. And public health is protected!



Beckman Industrial pH Meter

BECKMAN is the *only* modern pH equipment that can be used in boiling hot process solutions (invaluable in sugar refining and other food processes) . . . and in highly alkaline solutions, even in the presence of sodium ions. It is the *only* modern pH equipment providing rugged glass electrodes that will withstand direct pressures to 100 pounds . . . and the *only* glass electrode equipment offering automatic six-station pH control. These are only a few of *many* vital Beckman advancements. There is a size and type Beckman pH Instrument for every food processing application, large or small. Send for detailed literature!

FREE! *What Every Executive Should Know About pH—a booklet of helpful informative facts on modern pH control and its applications. Send for your copy today!*

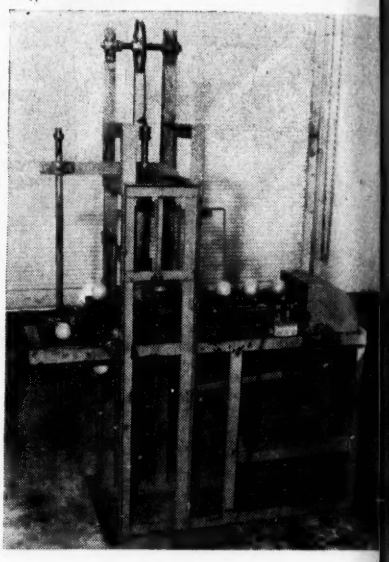
BECKMAN INSTRUMENTS
NATIONAL TECHNICAL LABORATORIES
South Pasadena California

BECKMAN INSTRUMENTS CONTROL MODERN INDUSTRIES

meet individual requirements in si of opening for passage of material be inspected, and in sensitivity.

Peach Pitter

FREESTONE peaches or apricots are c in half around the suture of the fru and the pit is ejected from betwe the halves without injury to the fr by a new machine manufactured b Atlas Engineering Co., Emeryvill Calif. It is said to handle ungrad fruit at any point of maturity fro



Freestone peach pitter.

soft to hard green. For orchard dry yard use, an attachment automatically conveys and delivers the fruit on drying trays. The capacity of the ma chine ranges from 5 to 7 cannery boxes of apricots per hour or from 20 to 3 boxes of peaches per hour, depending upon the size of the fruit and th efficiency of the operator.

Adjustable Chair

KEWAUNEE MANUFACTURING Co. Adrian, Mich., announces new post war models of its adjustable industria chairs and stools. Seat height is in stantly adjustable between 12 and 3 in., by merely lifting the seat. The backrest may be adjusted both verti cally and horizontally in relation to the seat.

Container Tester

GENERAL ELECTRIC Co., Schenectady 5, N. Y., recently designed its puncture tester to incorporate changes recommended by Institute of Paper Chemistry. This instrument measures the resistance of both puncture and bending of fiberboard, corrugated board, plywood and other types of container materials. The new tester is claimed to be sturdier and safer than the older

HANDLING + Processing + HANDLING + Assembling + HANDLING + Packing + HANDLING + Storage + HANDLING

HANDLING—the Common Denominator of PRODUCTION

LET MEN DIRECT POWER—NOT GENERATE IT!

Handling materials—most common of all production operations—is the key to better plant, dock and terminal performance. Handling starts with the raw materials, follows on through all phases of production and distribution, never stopping until the finished product is delivered to final destination.

Versatile Towmotor—*the one-man-gang*—provides you with a handling system that assures full benefits from other new and modern machinery. Towmotor capably performs hundreds of important handling operations. Save time, manpower, money—*write today* for the Towmotor DATA FILE . . . it gives you the complete story.

TOWMOTOR

THE ONE-MAN-GANG

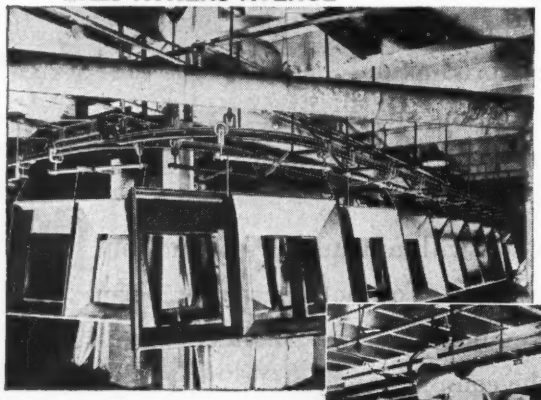
TOWMOTOR CORPORATION • 1222 E. 152ND STREET, CLEVELAND 10, OHIO

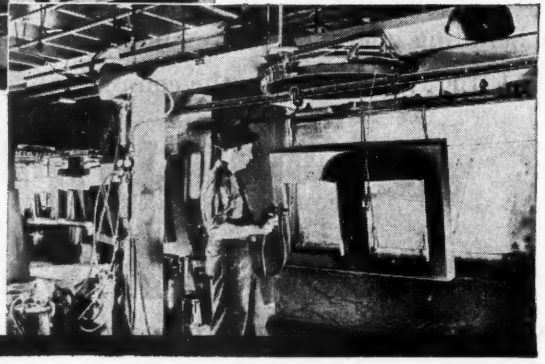
A well known furnace manufacturer has eliminated the bottle-neck in their enameling section with the use of infra-red drying and American MonoRail Overhead Handling System. Where casing sections would pile up in the spray booth, often requiring over 30 minutes—it now takes only 8½ minutes to bake the finishes.

American MonoRail synchronizes all pre-baking operations with baking time. The system extends from the sheet metal section, through spraying, baking, wrapping and returns to fabricating and welding stations. A turntable in the track permits reversing of carriers holding the pieces so that operator may spray all sides without touching the sprayed surfaces.

Our engineers will gladly show you how your products can be carried at the lowest possible cost and the highest possible efficiency.

THE AMERICAN MONORAIL COMPANY
13125 ATHENS AVENUE **CLEVELAND 7, OHIO**

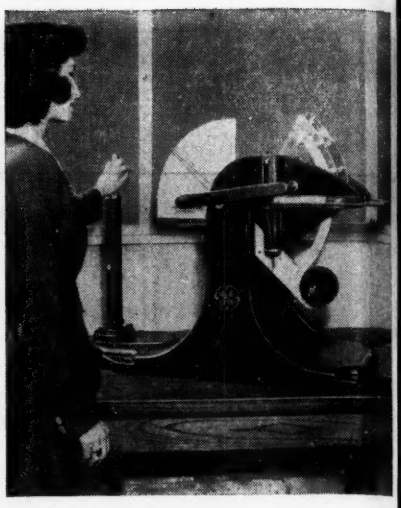




Storage bank on tracks assures supply of parts to sprayer.

★ ★ ★

Turntable in track allows quick movement of parts in spray booth.

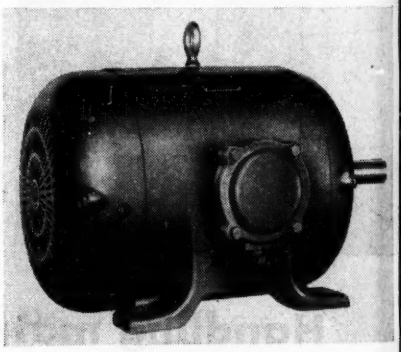


Puncture tester.

models and is capable of testing more diversified grades of board with greater accuracy. The scale is now stationary and the pointer independent of the pendulum, thus minimizing the possibility of deflecting the pointer by jarring. Moreover, the stationary scale, with the pointer held at its correct scale value by a simple friction bearing, is easier to read.

Explosion-Proof Motor

CENTURY ELECTRIC Co., 1806 Pine St., St. Louis 3, Mo., announces a new explosion-proof motor for operation in



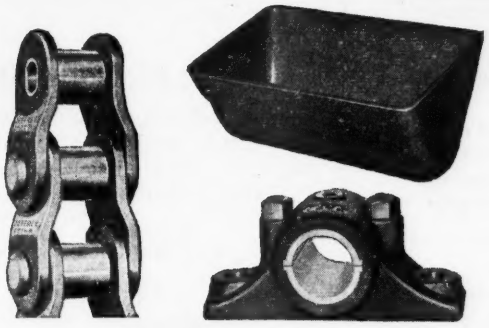
Explosion-proof motor.

Class I, Group C. This motor is constructed to meet the specifications of and carry the label of Underwriters Laboratory, Inc., for this classification.

Live-Steam Heater

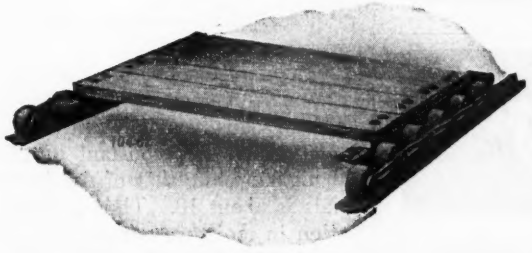
EMPLOYING a new muffler diffuser-type mixing nozzle, a live-steam water heater developed by O'Brien Steam Specialty Co., 205 Harrison St., Syracuse 2, N. Y., is said to be efficient and quiet. With this type of unit, all of the heat in the steam is delivered to the water, and the condensate itself is utilized as hot water. There is no waste of condensate, and no condensation return system is required.

Keep your production rolling with genuine Jeffrey PARTS

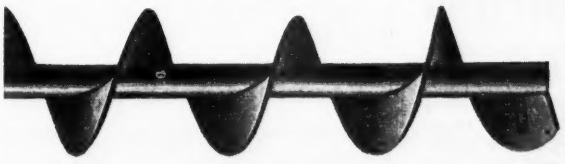


Chains, Buckets, Gears, Bearings, Take-Ups, Sprockets, etc.

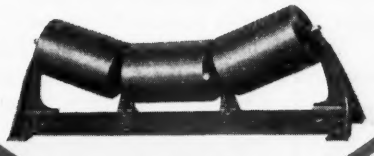
Steel Apron Conveyor



Wood Apron Conveyor



Spiral Conveyor



3 Roll Belt Idler

FOOD PLANTS are as vital to the war effort as any munition, arms, or equipment plant. Production of food must be kept rolling not only to feed our armed forces but to supply the home front.

JEFFREY EQUIPMENT—conveyors, feeders, dryers, bucket elevators, chains, crushers, pulverizers, portable conveyors and loaders—are doing a major job in the food plants of this country.

THE USE OF JEFFREY parts not only insures quick, easy maintenance but freedom from frequent breakdowns. Whether your equipment is Jeffrey built or not, Jeffrey parts are often interchangeable with your present parts.

JEFFREY CAN SUPPLY a wide range of maintenance items—some are shown—as well as technicians and engineers to assist you in maintaining a steady production flow—or can help you in developing an efficient material handling system.

Consult a Jeffrey Engineer.

THE JEFFREY MANUFACTURING COMPANY

ESTABLISHED IN 1877

927-99 North Fourth Street, Columbus 16, Ohio

Do You ---- emulsify, thicken, stabilize, suspend or gel ?

We offer two seaplant extractives which may prove to be the answer to your emulsifying, suspending, thickening or stabilizing problems:

KRIM-KO GEL—an all-purpose colloid-assistant which, with improved techniques of use, can prove effective in practically all food, pharmaceutical and industrial applications.

CARRAGAR:—an agar-type gelatin which forms tender, fruit-like gel over a wide pH range. Does not require acidulation to produce desired results.

Both products are now being successfully used by nationally known manufacturers in many fields. Write for literature, and any desired specific techniques.

FREE! Write today for sample of new agar-type jellying agent!

KRIM-KO Company
SEAPLANT PRODUCTS
DIVISION
SCITUATE, MASSACHUSETTS

YARWAY Spray Nozzles

INVOLUTE TYPE FOR CONE-SHAPED SPRAY

for WASHING • RINSING • COOLING • HUMIDIFYING

Get the most out of your Spraying Equipment without unnecessary power or liquid waste.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute type producing a fine cone-shaped spray with minimum energy loss, and Yarway Fan type producing a flat, fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Many thousands in use. Write for literature.

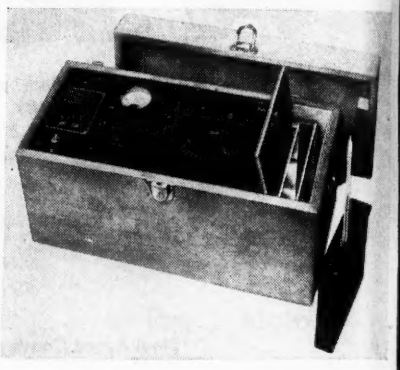
YARNALL-WARING CO., 127 Mermaid Ave.
Philadelphia 18, Pa.

FAN TYPE FOR FLAT SLICING SPRAY

The unit is designed for steam pressures of 50 to 150 lb. Steam-pipe sizes range from ½ to 1½ in., with capacities as high as up to 5,500 gal. per hour. A wide selection of temperature ranges is available, making the unit practicable either as a primary or a booster heater. While copper alloys remain on the critical list, the mixer body is being supplied in close-grained iron.

Dielectric Moisture Meter

RAPID electrical moisture determinations can be made by a new dielectric moisture meter introduced by C. J. Tagliabue Manufacturing Co., Park & Nostrand Aves., Brooklyn, N. Y. This instrument is designed for measuring the moisture content of powdered or granular materials, such as grains, flours, soaps and dehydrated foods.

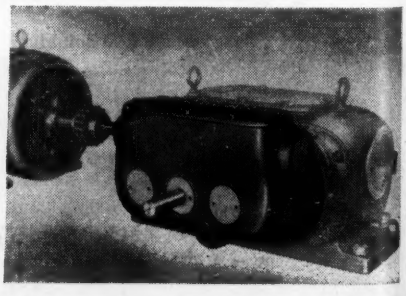


Dielectric moisture meter.

The dielectric constant of water is about 80, while that of the food materials is about 10. Thus a slight variation in moisture content has a measurable effect on the dielectric meter. It is said that a moisture determination can be made in less than 2 minutes.

Variable-Speed Drive

USING an 1800-r.p.m. squirrel-cage motor as the source of power, a new differential variable-speed drive consists of two mechanical differentials and a standard variable-speed reducer. Output speed can be obtained from 0 to 800 r.p.m. in one direction, or from 400 r.p.m. forward through 0 to 400



Differential variable-speed drive.

Rely on National's application research for an adhesive to keep pace with high-speed production

War-speed production calls for miracles in accelerated adhesion *of surfaces under tension.* Countless weather-proof fibre cases for overseas shipment of food and ammunition have to be sealed. Countless folding boxes for medical supplies have to be seamed. Countless rolls of fabrics and blueprints have to be spliced for continuous run.

National's successful experience in gaining maximum production speeds from modern packaging machinery is based upon an expert knowledge of the chemical and mechanical requirements of each adhesion problem — and an expert knowledge of adhesive formulations.

National makes every type of adhesive. And to the one exact formulation, National adds an extra margin of operating safety as insurance against commercial variables. Because the value of an adhesive is based, *not upon its almost insignificant unit cost,* but upon the final sales protection it gives to your product.

You can safely rely upon National's application research to engineer the one exact adhesive to your specific job. Inquiries are invited — NOW!

Offices: 270 Madison Avenue, New York 16; 3641 So. Washtenaw Avenue, Chicago 32; 735 Battery Street, San Francisco 11, and other principal cities.

national ADHESIVES

EVERY TYPE OF ADHESIVE FOR EVERY TYPE OF ADHESION

SYNTRON

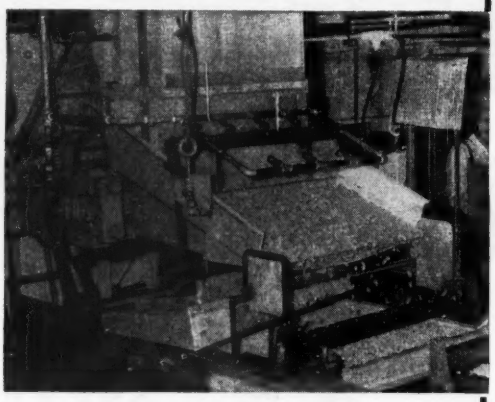
"Vibra-Flow"

VIBRATORY

Dewatering

FEEDERS

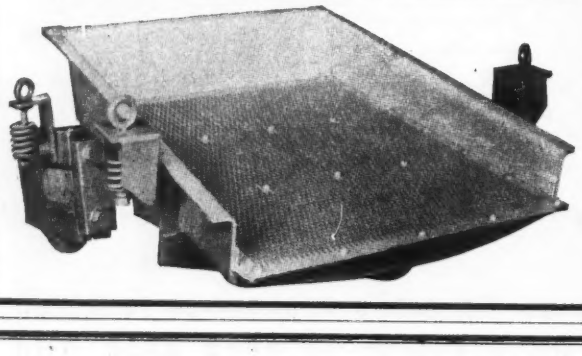
with rheostat control of rate of flow.



In dehydrating plants—controlling the flow of foodstuffs to drying trays.

Feeding bulk materials to mixers, packaging machines, belt conveyors, driers, etc.

No moving, wearing mechanical parts.



Large and Small Models.

Write us about your problem.

SYNTRON CO.
460 Lexington Ave.
Homer City, Pa.

Pears, Pickles, Pretzels or Pastry

PACKAGING DIVISION E. W. Twitchell, Inc.

Can Package Your Product

. . . NO MATTER WHAT YOU MAKE

PACKAGING ENGINEERS — Our facilities include design and manufacture of stock or special wrappings and packagings. We have solved many a packaging problem — if you have an out-of-the-ordinary product — difficult to wrap or package, let us show you how best to dress it up for the consumer.

PACKAGING HEADQUARTERS Our organization is headquarters for every type of food packaging. We are *packaging specialists.*

NEW IDEAS — We sponsor novel presentations. We are sales minded — and create eye catching packagings that move goods. Consultation invited . . . no obligation.

FROZEN FOODS PACKAGING MATERIALS — Our "PAKSURE" line of wrappings, bags and cardboard containers for storing fruits, vegetables, meats, fish and poultry covers every need in this field. Send for our new catalog of "PAKSURE" packaging materials.

Packaging Division
E. W. TWITCHELL INC.

777 PUBLIC LEDGER BLDG.
PHILADELPHIA 6, PA.

"Specialists in Special Purpose Paper Packagings"

r.p.m. reverse. The distinctive feature claimed for this unit is constant torque throughout the entire range. The control shaft may be operated with but a few inch-pounds of torque, while the output shaft will deliver the full power of the unit.

Many variations of the basic unit, designed for specific applications, may be supplied by Ohio Gear Co., Cleveland, Ohio, 1316 E. 179th St.

Electric Controllers

INTRODUCTION of electric contact controls for circular chart electronic potentiometers is announced by the Brown Instrument Co., 4536 Wayne Ave., Philadelphia, Pa. The electric contact controllers are available in two

Potentiometer with electric contact controller.

forms. One will contain a locking-in type relay, designed primarily for electric furnace control. The other is without a relay, and is designed for direct control of motorized valves, operation of signaling devices, and other applications requiring a "dead" neutral.

Plastic-Coated Belting

PLASTIC-COATED conveyor belting introduced by the Buffalo Weaving & Belting Co., 260 Chandler St., Buffalo, N. Y., is especially designed to meet the needs of canners and food processors. This belting is said to be impervious to oils, greases, moisture, acids and alkalis. It consists of a pliable plastic coating over a woven cotton carcass, having a semismooth, semiglossy surface that won't absorb moisture and is easy to keep clean. It will withstand temperatures up to 240 deg. F. This new PlasTex belting is available in standard colors of red or white. It comes in three standard constructions: regular coat, one side; regular coat, both sides; heavy coat, carrying side—regular, pulley side.

CATALOGS & BULLETINS

FOOD PLANT EQUIPMENT

Vacuum Pumps—Several types of Tubejet vacuum pumps are illustrated in a 4-page bulletin issued by C. H. Wheeler Mfg. Co., Lehigh and Sedgley Aves., Philadelphia 32. Among other pumps shown are high-pressure and high-superheat units with jet intercondensers.

Pulverizer — Covering the pulverizer line from the basic features of construction and design to the application of these machines in many phases of the food field, a 40-page catalog has just been issued by Pulverizer Machinery Co., Summit, N. J. The catalog is extensively illustrated with photographs of actual installations. A 2-page index lists materials to which the Mikro-Pulverizer is applicable.

Speed Reducer—Book No. 1824 is announced by Link-Belt Co., 307 N. Michigan Ave., Chicago. This "Data Book on Worm Gear Speed Reducers for Industrial Applications" contains 100 pages and is replete with photographs, dimensioned line drawings, engineering data and horsepower ratings. A table of weights and dimensions enables the reader to make his own selections of the type and size of reducer required for a specific service.

Processing Equipment—H. K. Porter Co., Inc., Oliver Bldg., Pittsburgh 22, Pa., and its two divisions, J. P. Devine Manufacturing Co., and Quimby Pump Co., have issued their first catalog. Forty different categories of process items, ranging from the smallest agitator to huge process vessels, are listed, with many illustrations, engineering drawings and descriptions of operating principles. Equipment described includes mixers, agitators, mills, kettles and pressure vessels. Also listed are autoclaves, dryers, fractionating columns, heat exchangers, pressure vessels, tanks and pumps.

Water Cooling Towers—Published by C. H. Wheeler Mfg. Co., Philadelphia 32, is a 20-page catalog, No. 145, featuring water cooling towers. This catalog is profusely illustrated with photographs of installations. Both forced- and induced-draft installations are covered. The catalog also contains considerable engineering data on water cooling.

Counting Scales—Described in a new circular just published by Howe Scale Co., Rutland, Vt., are many styles and capacities of counting scales. Included are single, double, triple and all-ratio models with Weightograph, dial and beam indications.

Steam Condensers—A 4-page bulletin has been issued by C. H. Wheeler Mfg. Co., Lehigh and Sedgley Aves., Philadelphia 32, illustrating several types of dual bank surface condensers.

Magnetic Separators—Nonelectric magnetic separators to remove tramp iron from grains and other foods are described in a 4-page bulletin issued by Eriez Mfg. Co., Erie, Pa. Permanent magnets are employed in the separators.

PLANT SUPPLIES

Pipe Insulation—Prefabricated pipe insulating units for tile or cast iron conduit systems are discussed in a 12-page catalog, No. 44, issued by Ric-wil Co., 1572 Union Commerce Building, Cleveland, Ohio.

V-Belt Drive—"From the Shadoof to the Dominant Drive" is the name of a 48-page booklet that gives a thumbnail history of man's effort to transmit power for his own benefit. This may be secured from Multiple V-Belt Drive Association, 140 S. Dearborn St., Chicago 3, Ill. The booklet is well illustrated and is interesting reading.

Enriching Bread Data—A booklet covering the enriching of bread has been prepared by American Institute of Baking, 1135 Fullerton Ave., Chicago 14, Ill. It discusses the history of enrichment and presents tables and a chart showing the contribution of bakers' enriched bread to the American diet. The tables are in detail and are useful in finding the content of various enriching ingredients per unit of bread.

Stainless Steel Welding—How to select the proper electrodes for welding stainless steels is told in a new informative booklet issued by Page Steel & Wire Division of American Chain & Cable Co. Inc., Monessen, Pa. Helpful information on welding procedure is given.

Milled Sponge Rubber Products—Issued by B. F. Goodrich Co., Akron, Ohio, is a new catalog illustrating its line of milled sponge rubber products. The catalog describes how these are made from either synthetic or reclaimed rubber, it gives sizes, weights and other pertinent data. These products are widely used for sealing, cushioning and absorbing vibrations. They may be made up in special grades and shapes for special applications to suit particular needs.

CONTROL EQUIPMENT

Control Instruments—Just issued is a general catalog of modern precision control instruments by Leeds & Northrup Co., Fisher Station, Philadelphia 44, Pa. This catalog contains 28 pages and is well illustrated with application photographs and engineering charts covering numerous fields.

Productive Coloration—In a well-illustrated bulletin, printed in color, L. Sonneborn Sons, Inc., 88 Lexington Ave., New York 16, N. Y., describes how the proper selection of colors on various parts of machinery has a direct bearing on efficiency, safety and production output.

Level Control—Manning, Maxwell & Moore, Inc., Bridgeport, Conn., announces a new 20-page catalog fully describing its level float control.

MISCELLANEOUS

Glass Specialties—Catalog 95-A is the first one issued by Fischer & Porter Co., 925 County Line Road, Hatboro, Pa., covering precision-bore glass tubing and glass specialties which may find application in special problems in the food industries. Many examples of precision-bore glass specialties are included.

Truck Tires—An analysis of the truck-tire situation, now and in the immediate future, as well as a discussion of the quality and service of synthetic truck tires, is given in a 16-page booklet entitled "Today's Truck Tire Outlook"; published by Pennsylvania Motor Truck Association, Inc., Harrisburg, Pa.

Facts About Atlanta—The 1944 edition of "Facts in Figures About Atlanta" for reference purposes may now be secured from the Industrial Bureau of the Atlanta Chamber of Commerce, Atlanta, Ga. This is a 40-page booklet containing considerable statistical information, as well as other pertinent data regarding this community.

Mobile Canteens—Eight basic models of mobile canteens for in-plant feeding are described and illustrated in an attractive 12-page catalog issued by S. Blickman, Inc., Weehawken, N. J. An entire page is devoted to each model, with large photographs showing various features. A full description and specifications are given for each model in detail. The larger canteens are fairly complete restaurants on wheels.

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BOOKS

Chemical Guide

USES AND APPLICATIONS OF CHEMICALS AND RELATED MATERIALS, Vol. 2. By Thomas C. Gregory. Published by Reinhold Publishing Co., 330 W. 42nd St., New York 18, N. Y., September, 1944. 459 pages; 6¼ x 9¼ in.; cloth. Price, $9.

Written as a guide to current industrial uses, potential applications and sales possibilities of chemicals and their products, this second volume compliments Volume I, published in 1939.

The present book covers 2,642 chemicals and related materials, which were not included in Volume I. The various indexes, a new feature, were compiled by the author to provide an accessible and highly useful presentation of important information. The Uses and Applications section of the book is again founded on material published in the *Oil, Paint and Drug Reporter*.

Fat Chemistry

FATS AND OILS. By H. G. Kirschenbauer. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y., November, 1944. 154 pages; 6x9¼ in.; cloth. Price, $2.75.

This is an outline of the chemistry and technology of fats and oils. The author set out to present the information in a way that would meet the needs of those engaged in the industries that utilize these materials either directly or indirectly.

It goes without saying that such a book is of interest and value to both the food technologist and the cereal chemist. This is especially true of the chapters on analytical methods, the constituents and components of fats, their structure and classification and the nature of fats and fatty acids. A brief description of more than 20 of the important fats is also included.

Analyst's Manual

COMMERCIAL METHODS OF ANALYSIS. By Foster Dee Snell and Frank M. Biffen. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y., 1944. 753 pages; 5½x8½ in.; cloth. Price, $6.

A food chemist, asked to determine the composition of a product, might very well find himself in a quandry unless he happened to have had considerable prior experience of that specific type.

While this book is addressed to the whole field of analytical chemistry, its purpose is to show the method of approach to analysis of the many complex commercial products on the market today. The book attempts to develop an inexperienced analyst into an experienced one by logical methods. It sets forth in orderly sequence the preliminary steps that necessarily precede the analysis and then goes on to the subsequent procedure, clarifying the meaning of each step along the way, often giving the reason.

Many of the methods and ideas presented have been developed and used over a period of 20 years in commercial laboratory operations. It may, therefore, serve as a manual to the industrial analyst as well as to the advanced student.

GOVERNMENT PUBLICATIONS

DIRECTORY OF THE MEAT INSPECTION DIVISION OF WAR FOOD ADMINISTRATION. Detailed personnel list. Available from Superintendent of Documents, Washington 25, D. C. Price, 10 cents.

FREEZING INJURY OF FRUITS AND VEGETABLES. By D. H. Rose and others. Department of Agriculture. Circular No. 713. Available from Superintendent of Documents, Washington 25, D. C. Price, 10 cents. Discusses precautions and consequences in freezing commercial supplies.

MEAT DEHYDRATION. Department of Agriculture, Circular 706. Available from Superintendent of Documents, Washington 25, D. C. Price, 10 cents. A report of the research work for commercial development of meat dehydration by Agricultural Research Administration.

CHANGES IN WOMEN'S EMPLOYMENT DURING THE WAR. By Mary E. Pidgeon. Special Bulletin No. 20 of the Women's Bureau, Department of Labor. Available from Superintendent of Documents, Washington 25, D. C. Price, 10 cents.

VANILLA CURING AND ITS CHEMISTRY. By Francisca E. Arana. Puerto Rico Federal Experiment Station. Bulletin No. 42. Available from Superintendent of Documents, Washington 25, D. C. Price, 5 cents.

COMPILATION OF THE SOCIAL SECURITY LAWS. Unnumbered document published by Social Security Board. Available from Superintendent of Documents, Washington 25, D. C. Price, 15 cents. Summarizes the Social Security Act, amendments and code, as in force July 1, 1944.

AN OUTLINE FOR MAKING SURVEYS. Bureau of Foreign and Domestic Commerce, Economic Series No. 34. Available from Superintendent of Documents, Washington 25, D. C. Price, 10 cents. A resume of methods and questions to be considered when making a commercial, industrial, community, or regional survey for goods marketing, employment prospects, and other business purposes.

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Fruits (Fresh or Frozen)	Vegetables (Fresh or Frozen)

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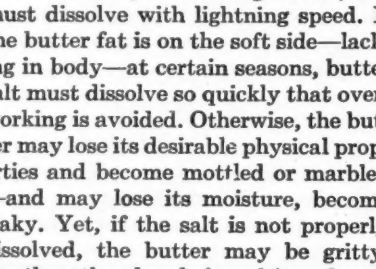
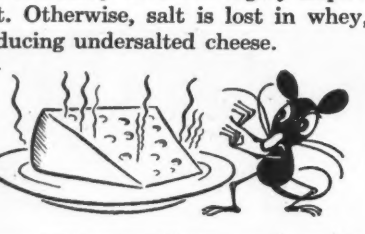


To meet these problems, we have set up definite solubility standards for Diamond Crystal Salt. Our Diamond Crystal Butter Salt, for example, dissolves completely in water at 65° F. in less than 9.8 seconds—average rate, 9.2 seconds. Quality-minded food processors can depend on Diamond Crystal products, manufactured under strict quality-control standards for solubility rate.



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PATENTS

Egg Meats Freed From Chalaza Without Substantially Disturbing Natural Adherence of Individual Egg Meat Particles to Each Other—James Milton Hansen, Chicago, Ill. No. 2,361,028. Oct. 24, 1944.

Invertase Absorbed on Solid, Dry and Stable Carrier—Carl A. Neuberg, to Warwick Chemical Corp., New York, N. Y. No. 2,361,315. Oct. 24, 1944.

Starch Prepared From Raw or Partially Purified Sweet Potatoes by Fermentation With Yeast For Removal of Sugar Content—William R. Richee, to Stein, Hall and Co., Inc., New York, N. Y. No. 2,361,498. Oct. 31, 1944.

Sirup Prepared From Fruit Juice Through Use of Small Quantities of Whiting and Magnesium Carbonate—Sam Avis, Chicago, Ill. No. 2,361,586. Oct. 31, 1944.

Oxygen of Air Swept Out of Bottles Containing Carbonated Beverages by CO_2 Liberated Through Increase in Temperature of Beverage Before Sealing of Bottle—Samuel Henry Ayers, to Crown Cork & Seal Co., Inc., Baltimore, Md. Nos. 2,361,587 and 2,361,588. Oct. 31, 1944.

Fruit, Vegetables and Similar Oxidizable Juices Filled Into Sealable Containers So as To Displace Previously Introduced Inert Gas and Sealed With Inert Gas in Head Space at Substantially Atmospheric Pressure—Ronald B. McKinnis, Winter Haven, Fla. Nos. 2,361,640 and 2,361,641. Oct. 31, 1944.

Fruit, Grape and Vegetable Juices Preserved Without Fermentation by Colloidally Atomizing, Homogenizing and Freezing Under High Vacuum With Removal of Vapors and Gases—Ernest Leon Victor Emile Lizeray, Paris, France, to Alien Property Custodian. No. 2,361,695. Oct. 31, 1944.

Coconut Emulsion Made by Reducing Dry Shredded Particles to About 100 Mesh Size During Passage Under Air Pressure Through Planar Cutting Knives Rotating at High Velocity—James F. McCashen, Bay Village, Ohio, to Roto-Cut Corp. No. 2,361,697. Oct. 31, 1944.

Individually Wrapped Blocks of Cheese Pressure-packed to Occupy Space Equal to Size and Shape of Package and Confined by a Sleeve to Be Held in Place and Forced Into Box Container Without Entrapment of Air—Benjamin F. Davis, Arena, Wis., to Wingfoot Corp., Akron, Ohio. No. 2,361,749. Oct. 31, 1944.

Cheese in Plastic State Mechanically Formed Into Sheet, Slit Into Sections of Predetermined Size and Shape, Assembled With Plural Sections in Face to Face Relation and Wrapped as Unit—Norman Kraft, Wilmette, Ill., to Kraft Cheese Co., Chicago, Ill. No. 2,361,775. Oct. 31, 1944.

Cheese Pressed in Horizontal Hydraulic Cylinder—Norman J. Peters, Fond du Lac, Wis., to Damrow Brothers Co. No. 2,362,089. Nov. 7, 1944.

Cheese Sampled with Trier Designed to Compress Plug to Assist in Its Removal—Norman J. Peters, to Damrow Brothers Co., Fond du Lac, Wis. No. 2,362,090. Nov. 7, 1944.

Fruit Halved in Machine Designed to Deliver Halved Portions Into Predetermined Paths of Movement With Cut Surfaces Facing in Predetermined Direction—Lawrence A. Fry, Hollywood, Calif., to General Foods Corp., New York, N. Y. No. 2,362,126. Nov. 7, 1944.

Cheese Pressed In Vertical Unit Provided With Central Drain Tube and Base Plate Carrying Equally Spaced Radial Ribs Projecting Inwardly To Drain Tube—Edward B. Patrick, Rock, W. Va. No. 2,362,154. Nov. 7, 1944.

Oranges and Similar Fruit Freed of Wrappers by Mechanical Means—James Bryant Crawford, Moline, Ill., one-half to L. O. Morford, Fort Dodge, Ia. No. 2,362,356. Nov. 7, 1944.

Sugar Liquors Treated to Obtain Simultaneous Rapid Filtration and Substantial Clarification of Liquor—Arthur B. Cummins, Millington, N. J., to Johns-Manville Corp., New York, N. Y. No. 2,362,357. Nov. 7, 1944

Lactose Used as Only Added Sweetening Ingredient to Canned Sugar-nitrate Cured Meats to Inhibit Acid and Gas Formation—Lloyd B. Jensen and Walter R. Hess, to Industrial Patents Corp., Chicago, Ill. No. 2,362,441. Nov. 14, 1944.

Hair Recovered From Animal Hide by Dissolving Hide Tissue With Peptic Enzyme From Lining of Animal Stomach in Solution Having pH of From 1.0 to 2.5 Followed by Neutralization and Heating—Victor Conquest, Chicago, and Havard L. Keil, Clarendon Hills, Ill., to Armour & Co., Chicago, Ill. No. 2,362,540. Nov. 14, 1944.

Canned Milk Heat Treated in Continuous Two-stage Method—Albert R. Thompson, Los Gatos and Joseph Bucher, Modesto, Calif., to Food Machinery Corp., San Jose, Calif. No. 2,362,733. Nov. 14, 1944.

Shell Eggs Graded by Radio Frequency to Determine Potential Rate of Deterioration Under Storage Conditions—Alexis L. Romanoff, to Cornell Research Foundation, Inc., Ithaca, N. Y. No. 2,362,774. Nov. 14, 1944.

Headspace of Filled Can Automatically Freed From Foam During Transfer From Filling to Closing Machines—Harry D. Ayars, Philadelphia, Pa., to Continental Can Co., Inc., New York, N. Y. No. 2,362,791. Nov. 14, 1944.

Air Removed From Headspace of Filled Containers by Sweeping Action of Fluid Medium Without Setting Up Turbulent Countercurrents of Fluid—John M. Boyd, La Verne E. Clifcorn and Gordon T. Peterson, Chicago, Ill., to Continental Can Co., Inc., New York, N. Y. No. 2,362,799. Nov. 14, 1944.

Air Removed From Headspace of Filled Container by Sweeping Action of Steam During Passage of Partially Closed Can From Lidding to Closing Machines—Herbert L. Minaker, Syracuse, N. Y., to Continental Can Co., Inc., New York, N. Y. No. 2,362,841. Nov. 14, 1944.

Weight of Flowable Fill in Containers of Commercial Usage Determined by Mechanical Means—Harry L. Griffin, Rockville Centre, N. Y., to Nestle's Milk Products, Inc., New York, N. Y. No. 2,362,997. Nov. 21, 1944.

Gelatine and Similar Edible Powders Added to Tomatoes Preparatory to Dehydration—Henry J. Moore, Islington, Ontario, Canada. No. 2,363,193. Nov. 21, 1944.

Biscuits, Cookies and the Like Fed In Continuous Manner Direct From Oven to Coating Machine—Allan Ashmead Tunley, to Baker Perkins, Ltd., Peterborough, England. No. 2,363,211. Nov. 21, 1944.

Skinless Sausages Filled Direct Into Canning Receptacle From Forming Press—William Muir Yuill, Edinburgh, Scotland. No. 2,363,218. Nov. 21, 1944.

Canadian Patents

Flour Sifted Through Shaker Type of Sieve Having Gyratory Movement—Paul Naeher, to B. F. Gump Co., Chicago, Ill. No. 423,658. Nov. 7, 1944.

Wheat Milled to Give Flour With High Extraction and Germ Content—Glenn H. Perrigo, to Victor Flour Mills, Inc., Pittsford, N. Y. No. 423,699. Nov. 7, 1944.

Sweetening Agent for Diabetic and Dietetic Foods Made to Consist of Sorbitol, Mannitol and Dulcin—Joseph Kuderman, Detroit, Mich. No. 423,712. Nov. 7, 1944.

Flour Subjected to Electrical Discharge During Centrifugal Mechanical Movement to Destroy Insect Infestation—Franklin S. Smith, New Haven, Conn. No. 423,741. Nov. 14, 1944.

Flour Subjected to Mechanical Impact by Centrifugal Force to Destroy Insect Infestation—Franklin S. Smith, Bethany, Conn. Nos. 423,742; 423,743; 423,744; 423,745; 423,746; 423,747 and 423,748. Nov. 14, 1944.

Perishable Food With or Without Coating of Water Immersed in Refrigerated Nonvolatile Liquid Until Frozen and Subsequently Washed Free From Liquid Refrigerant Preparatory to Storage at Low Temperature—Luis H. Bartlett, Austin, Tex., to University of Tennessee Research Corp., Knoxville, Tenn. No. 424,147. Nov. 28, 1944.

FOOD TECHNOLOGY

NEW DISCOVERIES AND INVENTIONS

DAIRY PRODUCTS

Evaporated Milk

INSTABILITY of the product on storage must be overcome before high-temperature short-time sterilization can be used commercially for evaporated milk. Color and flavor are much better for the high-short sterilized milks, but fat separation is marked and the process gives no opportunity to control the body or viscosity of the product.

Sterilization at 275 deg. F. for 30 seconds was tried, with concentrations at 26.0 and 32.5 percent solids. Control samples were sterilized at 239 deg. F. for 18 minutes. Treatments that increased the exposure of the concentrate to moderate temperatures—forewarming or heating in the can after sterilization—improved the viscosity of the product. Probably the advantages in storage stability after longer heating at lower temperature are due to changes in the casein. There also may be changes in the calcium and magnesium salts. The conditions which lead to long continued fluidity are associated with development of darker color and a cooked flavor.

Forewarming at 203 deg. F. for 10 minutes or 248 deg. F. for 4 minutes, or heating the sterilized evaporated milk in the cans at 239 deg. F. for 18 minutes, improved the storage stability of the high-short sterilized milks. Without supplementary heating the keeping time was only 4 weeks at 104 deg. F. Keeping time of the control under the same conditions was 32 weeks.

Digest from "Effects of Temperature and Time of Sterilization Upon Properties of Evaporated Milk," by R. W. Bell, H. R. Curran and F. R. Evans, Journal of Dairy Science, vol. 27, 913-19, November, 1944.

FATS AND OILS

Stabilizer Not Removed During Deodorization

STEAM DEODORIZATION of a fat or oil destroys peroxide and removes volatile products which may be present as a result of oxidation. For this reason steam deodorization will restore a measure of stability to a vegetable oil which has undergone oxidation.

When either lecithin or phosphoric acid is added before deodorization the stabilizer is not removed during the steam treatment. It has been found that for unoxidized oils the stabilizing effect is substantially the same whether these antioxidants are added before or after deodorization, but an oxidized oil is much improved by addition before deodorization.

The most desirable amount of each of the two antioxidants, determined experimentally, was found to be such that there is about the same percentage of phosphorus present in the oil. Lecithin is most effective in the neighborhood of 0.1 percent and phosphoric acid at 0.004 percent. Phosphoric acid in this amount is without effect on the color, but the lecithin causes darkening of the deodorized oil.

There is no evidence of regeneration of tocopherols from tocoquinone, even when antioxidants are present during the deodorization treatment.

Digest from "Notes on the Stabilization of Oxidized Fats by Steam Deodorization with Phosphoric Acid or Commercial Lecithin," by A. E. Bailey and R. O. Feuge, Oil & Soap, vol. 21, 286-8, October, 1944.

STORAGE

Vegetables in Storage

CONTROLLED-ATMOSPHERE storage tests on several vegetables have shown that reduction in the concentration of oxygen present reduces the loss of ascorbic acid during storage. These tests were conducted at temperatures between 50 and 75 deg. F. Oxygen was reduced to about 1.2 to 2.5 percent in most cases. Samples also were stored with reduced oxygen with the addition of around 18 to 20 per cent of CO_2.

Reduction of the oxygen content always lowered ascorbic acid loss, although the effectiveness varied with different vegetables. Asparagus, spinach and kale gave results 2.6 to 4 times as high as in the controls, the relative improvement being less with lower temperature. Inconsistent results were obtained with CO_2 atmospheres, the result sometimes being reversed with a change in storage temperature. There was a tendency for the CO_2 to accelerate loss of the vitamin, particularly at the higher storage temperatures.

An interesting result was found when the oxygen was reduced to 0.8 percent for a kale sample. Ascorbic acid loss was accelerated and the vegetable was found to have undergone destructive changes. The fact that there was a pronounced alcoholic odor indicated anaerobic fermentation.

For broccoli the reduction of oxygen had little beneficial effect, but the additon of CO_2 with low oxygen was decidedly helpful in ascorbic acid retention.

In normal vegetable storage, the destructive agents are molds and bacteria, so that commercial controlled-atmosphere storage, even if economically practicable, would not completely solve the problem of loss in quality.

Digest from "Effect of Modified Atmosphere Storage on Ascorbic Acid Content of Some Vegetables," by H. Platenius and J. B. Jones, Food Research, vol. 9, 378-85, September-October, 1944.

MEAT TECHNOLOGY

Rancidity in Bacon

RANCIDITY develops more rapidly in the fat of cured meats than in those not cured, although the curing salts protect the protein against spoilage.

Smoked Canadian Wiltshire bacon can be stored for at least 2 months at 0 to 32 deg. F., without development of rancidity in the fat, but the unsmoked bacon is usually rancid after 1 month. (Fresh pork fat is protected against rancidity for as much as 48 weeks at 0 deg. F.)

The critical period for oxygen formation is between 21 and 42 days. There is a significant difference in the behavior of similarly treated cuts from different hogs, but this phase has not been investigated as yet.

Free fatty acid formation was not found to be significant.

Digest from "Smoked Meats. II. Development of Rancidity in Smoked and Unsmoked Wiltshire Bacon During Storage," by W. H. White, Canadian Journal of Research, vol. 22, 97-106, September, 1944.

Preservation Problems

MEAT technologists will find much of value in a review of the literature on the microbiology of meats published recently. The author brings together 117 references, with a discussion of the subject matter grouped according to fields of interest. These include action of certain bacteria on myohemoglobin and nitric oxide derivatives formed in cured meats, antemortem and postmortem changes of tissues of food animals, action of microorganisms on fats, effect of nitrates and

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nitrites on bacteria in cured meats, action of salt on bacteria and recent developments grouped under the headings of dehydration, bacterial standards, hams and control of spores in canned meats.

Digest from "Microbiological Problems in the Preservation of Meats," by L. B. Jensen, Bacteriological Reviews, vol. 8, 161-88, September, 1944.

Meat Vitamin Loss

IN thermal-death-time test cans the destruction of thiamine and niacin of pork luncheon meat was markedly decreased by the use of higher temperatures and shorter times for an equivalent sterilizing effect. However, in commercial-size cans—12 oz., 2½ lb. and 6 lb.—the rate of heat transfer throughout the product is so slow that the processing temperature is not the major factor in retention of these vitamins. In 2½-lb. cans processed 146 minutes at 235 deg. F., the retention of thiamine was 40 to 45 percent for meat from the ends or outside of the loaf and 70 to 75 percent for that from the center. Riboflavin and niacin are less affected by prolongation of the exposure to elevated temperatures.

Effect of the longer exposure required to reach sterilizing temperatures in the center, with increased can size, is shown by the percentage retention of the four B vitamins investigated:

Can size	12-oz.	2½ lb.	6 lb.
Thiamine	73-76	46-60	38-49
Pantothenic acid	62-73	62-68	70-73
Riboflavin	86-95	71-81	67
Niacin	89-97	71-81	73-75

Digest from "Vitamin Retention in Processed Meat. Effect of Thermal Processing," by D. A. Greenwood, H. R. Kraybill, J. F. Feaster and J. M. Jackson, Industrial and Engineering Chemistry, vol. 36, 922-27, October, 1944.

PEST CONTROL

Facts on DDT

USES for this newly applied insecticide fall into three groups: in medicine and sanitation as a control against disease bearing insects, in agriculture as a control against certain crop destroying insects, and as a guide and stimulant to the development of other synthetic insecticides.

DDT is not a cure-all. It destroys lice and provides protection against reinfestation for a considerable period of time. It is effective against malaria-carrying mosquitoes, house flies and bedbugs. Its action is slow but certain. DDT is both a stomach and a contact poison.

For agricultural use its action is selective. It destroys such dissimilar pests as the Oriental fruit moth, Colorado potato beetle, corn leafhopper, European corn borer and the spruce bud worm. It is without effect on certain plant lice, the Mexican bean beetle, red spider, cotton boll weevil, grasshoppers and a few other insects.

Limiting factors in its use include toxicity, which has not yet been sufficiently explored. In powder form it is not absorbed and is nonirritating to the skin. In solution it is definitely, although not violently, toxic. In experimental animals, toxic effects from large doses are cumulative. As an agricultural spray, DDT has the unfortunate property of destroying certain harmless and even necessary insects, particularly the honey bee.

Pilot plant production was started in 1943 by one company, following process development work by the Orlando Station, U. S. Department of Agriculture. At present there are 10 commercial producers. Several more prospective producers are doing pilot plant development. Almost the entire output is going to the armed forces and to Lend-Lease. A continuous process has been developed for DDT production.

Digest from "DDT Fights Insects in War and in Peace," by J. R. Callahan, Chemical and Metallurgical Engineering, vol. 51, 109-14, October, 1944.

FERMENTATION

Yeast Culture

INCREASE of the vitamin B_1 of yeast in excess of the biological requirements of the yeast by addition of certain chemicals during the fermentation of the nutrient mash is covered by a recent patent. The activity of the yeast is relied on to form the proper linkage in the thiamine molecule.

Vitamin B_1 consists in its essential structure of a pyrimidine derivative linked to a thiazole derivative by a methylene (—CH_2—) radical. Synthesis of the vitamin has been expensive because it was necessary to start with a pyrimidine derivative having a methylene group in the 5 position, or else use a long indirect process.

According to the patent, a less expensive pyrimidine derivative containing a cyano radical in the 5 position, such as 2-methyl-5-cyano-6 aminopyrimidine, can be used. When this is added to the fermenting mash in equimolecular proportion with a suitable thiazole derivative, the yeast is able to establish the required methylene linkage between the pyrimidine ring and the nitrogen of the thiazole ring. The mash should be in vigorous fermentation, with a pH approximating 5.5 to 6, and at a temperature between 28 and 30 deg. C.

Dry yeast so produced may be brought up to as much as 700 micrograms of vitamin B_1 per gram of yeast, while yeast grown in the same nutrient medium but without the thiazole or pyrimidine compound may contain only 50 micrograms of B_1.

Digest from U. S. Patent 2,359,521, issued October 3, 1944, to H. E. Harrison, and assigned to Anheuser-Busch, Inc., St. Louis.

MISCELLANEOUS

Flash-Heated Eggs

DIPPING fresh eggs in boiling water for 5 seconds produces a thin protective film of coagulated albumen which adheres to the shell membrane. Fresh eggs thus treated have greatly improved storage qualities.

The treatment causes little damage to the natural consistency of the egg, and does not affect the flavor, color or foaming properties. Eggs so treated and stored at 41 deg. F. for 12 months were estimated to be equivalent in quality to untreated eggs similarly stored for 3 months. The flash-heat treatment is effective in retarding deterioration to some extent in eggs stored at room temperature.

Lower temperatures are ineffective; longer times produce a visible layer of coagulated albumen.

Digest from "A Study of Preservation of Eggs by Flash Heat Treatment," by A. L. Romanoff and A. J. Romanoff, Food Research, vol. 9, 358-65, September-October, 1944.

Synthetic Spice Base

CARRYING agents or bases for synthetic spices can be made by cooking a suitable cereal grain under steam in a container free from air, so as to produce a reddish-brown color by caramelization without causing oxidation of the fats of the grain product.

As a specific example, rye flour is agitated in a steam-jacketed pressure cooker until the jacket temperature is brought up to 275 deg. F. The cooker is then closed and air exhausted or swept out by the steam. The rye flour in the cooker is brought up to 270 deg. F. in 20 to 25 minutes, then held at that temperature for 75 to 80 minutes. Agitation of the flour is continued during all the heating, as well as during a subsequent drying period of about 15 minutes when the heat is on but the chamber is at atmospheric pressure. The base is then treated with a natural or synthetic spice oil.

The claims cover the process of preparing the base, without limitation as to the cereal grain used.

Digest from U. S. Patent 2,356,501, issued August 22, 1944, to R. O. Brown and C. G. Harrel, and assigned to Pillsbury Flour Mills Co., Minneapolis.

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21	Royal 2	36¼ lbs	36½ lbs.	V. good
22	Tallarook 2	34 lbs.	34 lbs.	V. bright, fresh
23	Tallarook 2	29½ lbs.	Kept by	Borthwick
24	Royal	34½ lbs.	34½ lbs.	V. bright, fresh
25	Tallarook 2	36¾ lbs.	37 lbs	V. bright, good
		37¼ lbs	37½ lbs.	V. good, bright

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FORMULAS FOR FOODS

FORMULA NO. 509

Cheese Bread

Flour	100 lb.
Water (variable)	60 lb.
Sugar	4 lb.
Salt	2 lb.
Yeast	3 lb.
Skim milk powder	4 lb.
Malt	1 lb.
Lard	4 lb.
Yeast food	4 oz.
Grated cheese	5 to 7 lb.

Directions

Mix the grated cheese with the dry ingredients. Make up as a medium stiff dough, smooth. Bake in Pullman pans, because toasted cheese bread is most desirable. Dough temperature should be 80 deg. F. Time for first punch, 1 hour, 30 minutes; second punch, 45 minutes; and on the bench, 15 minutes.

Formula from Experimental Bakery, Armour and Co.

FORMULA NO. 510

Banana Cake

Granulated sugar	4 lb.
Shortening	1 lb. 12 oz.
Bananas	1 lb. 8 oz.
Salt	1¼ oz.
Liquid milk	1 lb. 8 oz.
High-quality cake flour	3 lb.
Baking powder	1½ oz.
Whole eggs	2 lb.

Directions

Cream 3 lb. 4 oz. of sugar with the shortening, bananas and salt on low speed for 5 minutes. Dissolve 12 oz. of sugar in the milk and add. Sift together the cake flour and baking powder. Add and mix for 5 minutes. Finally, add the whole eggs, and mix in for 5 minutes more.

Bake at 360 deg. F.

Formula from Pillsbury Mills.

FORMULA NO. 511

Butterscotch Sandwich Cookie

Base Cake

Flour	200 lb.
Granulated sugar	37 lb.
Invert sirup	35 lb.
Shortening	40 lb.
Malt sirup	3 lb.
Salt	2½ lb.
Soda	(as required)
Ammonium bicarbonate	(as required)
Monocalcium phosphate	(as required)
Water	(as required)

Directions

This is a Quartermaster specification and does not give manufacturing directions, beyond requiring that these shall be in accordance with good commercial practice. Cookies must be baked to be tender and crisp.

Count 56 to 60 per pound of the base cakes, or 19 to 21 per pound of finished cookies, approximately 2¾ in. in diameter.

Shortening for the base is to be hydrogenated cottonseed or peanut oil, or mixtures of these. The Quartermaster requires an active-oxygen keeping test of 100 hours minimum. The shortening must retain satisfactory flavor and color after heating to 400 deg. F.

Make up with the sandwich filling so that 10 of the finished sandwich cookies have a total height between 5½ and 6 in.

Filling

Powdered sugar	300 lb.
Roasted skim milk	70 lb.
Plastic fat	190 to 210 lb.*
Salt	3 lb. 2 oz.
Vanillin	½ oz.

*Exact amount between specified limits to be adjusted to yield proper consistency for stenciling.

Directions

The plastic fat for the filler must be hydrogenated cottonseed, coconut or peanut oil, or mixtures of these. An active-oxygen keeping test of 60 hours minimum is required. It may contain added lecithin or other suitable plastic agents.

The dry skim milk must be extra grade, Class I. It is to be caramelized by a controlled heating process so as to have a uniform light amber color, with no scorched particles.

Vanillin must be U.S.P. grade crystals, with 100 percent passing through a 60-mesh sieve.

Formula from Quartermaster Corps Tentative Specification C.Q.D. No. 321, issued October 7, 1944.

FORMULA NO. 512

Ginger Cookies

Granulated sugar	2 lb.
Hydrogenated vegetable shortening	1 lb.
Brown sugar	1 lb.
Soda	¾ oz.
Salt	½ oz.
Pastry flour	3 lb.
Ginger	¼ oz.
Cinnamon	¼ oz.
Molasses	3 oz.
Whole eggs	1 lb.
Water	6 oz.

Directions

Scale the ingredients into the mixing bowl and mix at medium speed to a smooth dough.

This cookie dough can be mixed in as little as one or two minutes under ideal conditions.

Total weight is approximately 8¾ lb. Using a 2-in. die, scale the cookies about 8 oz. per dozen. One- to 3-in. dies can be used for this cookie. Baking temperature is 375 to 400 deg. F.

Formula from Procter and Gamble Co.

FORMULA NO. 513

Mocha Dessert Sauce

Unsweetened chocolate	5 percent
Coffee extract	0.5 percent
Butter (salted)	4.5 percent
Granulated cane sugar	25 percent
Light brown sugar	10 percent
Whole milk (fluid)	25 percent
Water	30 percent

Directions

Melt the chocolate and butter in a double boiler. Heat the milk and water to 180 deg. F. and dissolve the sugars in it. Pour the hot sugar solution into the melted chocolate and butter, stirring constantly. Cook until the mixture forms a soft ball in cold water. Remove from fire and incorporate the coffee extract flavoring.

In case the coffee flavoring is weak, increase until a proper mocha flavor is obtained.

Formula from B. I. Masurovsky.

FORMULA NO. 514

Soya-Vanilla Wafers

Whole eggs	6 lb.
Enzyme-converted corn sirup (1½ gal.)	18 lb.
Shortening	19 lb.
Butter	15 lb.
Granulated sugar	64 lb.
Full-fat soya flour	15 lb.
Salt (variable)	1 lb. 4 oz.
Vanilla (variable)	1 lb.
Color	1½ oz.
Water (variable)	88 lb.
Ammonia (variable)	14 oz.
Flour	100 lb.
Soda (variable)	1 lb. 8 oz.

Directions

Cream the eggs, sirup, shortening, butter, sugar, soya flour, salt, vanilla and color with 4 lb. of water, using low or medium speed. Dissolve the ammonia in the balance of the water, add and stir in. Sift the flour and soda together well. Add and mix smooth.

The temperature of batter should be 65 to 70 deg. F. Use a bleached flour, with 9 to 9.5 percent protein, 0.40 percent ash and a viscosity of about 90.

Regulate the consistency of the batter by adjusting the water.

Bake at 450 deg. F.

This is only a suggested formula, and the procedure must be tested carefully under the particular manufacturing processes and conditions occurring at each plant.

Formula from A. E. Staley Mfg. Co.

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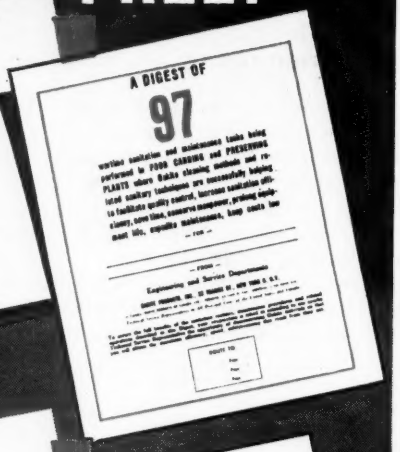

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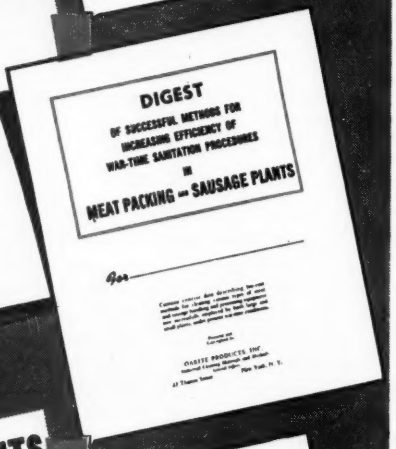
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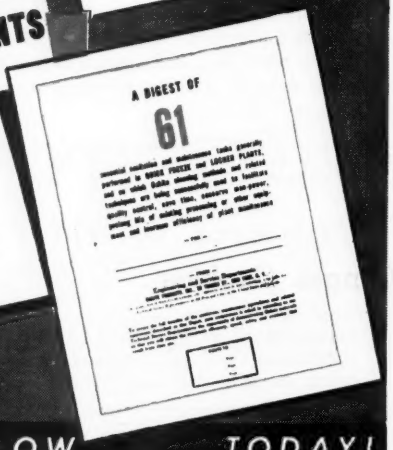

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Facts About Packaging Dehydrated Foods

(*Continued from page* 98)

is a slight darkening of the germ portion when stored at 130 deg. F., but the overall color, as shown by the color analysis, remains practically unchanged. The gas-packed samples retained the greater portion of their flavor through the 12 months of storage. A supplementary examination at 16 months indicated that they still were in satisfactory condition. There was no evolution of CO_2. However, there was rapid absorption of oxygen in the sample packed in air. At 75 to 80 deg. F., approximately two-thirds of the oxygen was used up after one year of storage. At 98 deg. F., all of the oxygen in the air-packed can was used up after 9 months of storage. At 130 deg. F., all of the oxygen had been absorbed after 3 months.

Discussion of Results

There was a very marked absorption of oxygen by the dehydrated hominy packed in air. In the original treatment of corn, a sulphite bleaching treatment is used in addition to the lye treatment. A portion of the oxygen consumed is probably due to oxidation of sulphites to sulphates. In addition, some oxygen is undoubtedly consumed by the oil in the germ portion of the hominy, because the decline in flavor rating resulting from rancidity coincided with the absorption of oxygen.

Cooperative Research Solves Egg Problems

(*Continued from page* 102)

defrosted eggs are used, and film formation is further encouraged. By equipping the heater under automatic temperature control with a bypass to recirculate half of the heated eggs and by gearing the pumps to give double delivery to the heater, foam formation is minimized. If the plates are kept uniformly full to the top, the film formation is retarded to the minimum by the rapid flow of the egg-meats. In this way, likelihood of clogged lines and spray nozzles is largely eliminated.

Film formation in the horizontal cylindrical heater known as the "votator," operating at 143 deg. F. and delivering 3,500 lb. per hour, was reported to be held to a negligible thickness by the plastic blade

How to calculate Rate of Heat Flow through Metallic Walls

As a result of work done by INCO Technical Service, a new booklet, "Heat Transfer through Metallic Walls," has recently been printed.

It explains in detail how to calculate heat transfer, and covers conductance values of film, scale, and condensing vapor film. It also includes tables on thermal conductivity of various metals, conductance ranges for metallic walls and films and other phases of the subject.

A valuable section of "Heat Transfer through Metallic Walls" consists of charts on heat transfer co-efficients for 11 different metals:

Copper	**Lead**
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Red Brass (85-15)	**Monel**
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In addition to the information contained in this bulletin, INCO Technical Service will gladly furnish personal assistance in the solution of specific heat transfer problems.

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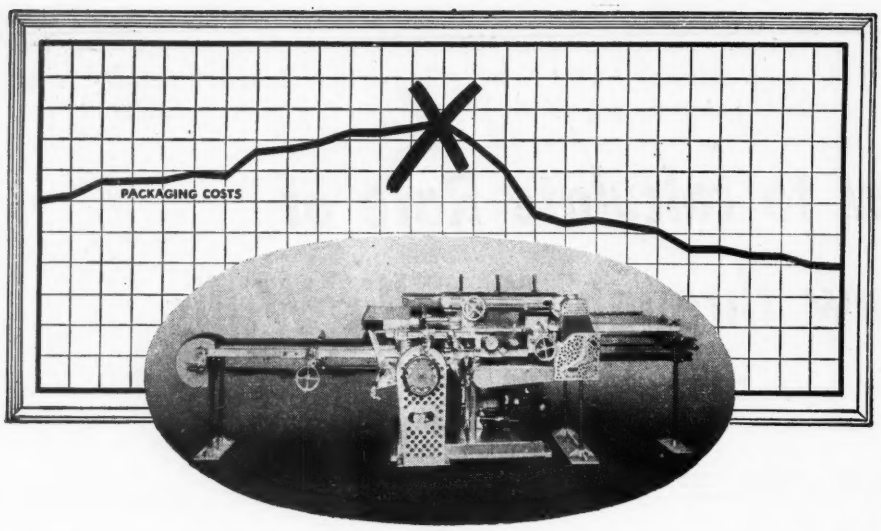

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cleaners on the agitator. These keep the eggs constantly in motion and the stainless steel inner surface free from coagulum during heating. Even with this type of heater, precaution should be taken to prevent foaming by recirculation of half the heated egg-meats and to prevent the formation of coagulum on the high-pressure valves by spraying cold water against the pump block or by cooling the eggs to 130 deg. F. in 10 ft. of 1-in. pipe jacketed by a 2-in. pipe carrying water at 54 deg. F.

Faulty gaskets and rough handling and careless cleaning of equipment were emphasized as being contributory to heater and pressure-pump operation troubles. The contributing causes cited are bent plates, surfaces scratched by wire brushes or abrasives, battered connections and pipes and damaged valves. Recommendation was made that water of 180 to 185 deg. F. be run through the equipment to sterilize and to test out valves and connections before bringing them to operating temperature for egg heating as steps in obtaining improved performance by the heaters and pumps. Also, since mineral deposits on the water side of the plates have an insulating effect, recommendation was made that softened water be used in hard-water areas or that the plates be washed by the same methods as for removal of milk stone.

While preheating of the egg-meats was started as a means of obtaining egg powder with sufficient low moisture content to inhibit the undesirable reaction between the sugar and protein constituents of the egg whites, preheating is not regarded as the complete answer to the problem of obtaining powder with 2 percent or lower moisture content. As the drying studies under the research program progressed, methods for increasing production per plant were developed.

Multistage Drying

Under the direction of Dr. Ralph Conrad of Kansas State College, in his capacity as expert consultant to the QMC Subsistence Research and Development Laboratory, studies were begun to determine the advisability of using more than a single stage in the drying operation of making low-moisture powder. Early results showed that lowering of the temperature in the dryer and subjecting the resulting powder of 4½ to 5 percent moisture content to subsequent drying stages not only increased appreciably the production of 2 percent powder but also gave

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powder of improved color and flavor, of less fluffy texture, and of greater uniformity in palatability. These benefits result because egg meats with approximately 5 percent moisture have greater stability at elevated drying temperatures.

How the additional stages of drying are obtained depends on the type of primary dryer used, on the geographical location of the drying plant with respect to humidities of the summer months (which to a large extent governs the moisture content of the air going into the dryer), and on the desired rate of production from an existing dryer. In some plants, two-stage drying is obtainable in the primary dryer. In others, multistage drying is obtained by adjustment of air temperature and rate of flow to make second-stage and third-stage dryers out of the primary and secondary collectors. In other instances, special units were installed as redryers of the 4½ to 5 percent powder delivered from the spray dryer. In these units the moisture content of the powder can be reduced to 0.5 percent or lower.

The condition to be obtained for the production of 2 percent powder is that the air coming in contact with the powder must have no greater moisture-vapor pressure than the powder would have at the final drying temperature. In application, however, the equilibrium of the two vapor pressures is never quite obtained, which means that the air must have a lower vapor pressure than the equilibrium value. Unless redryers are used, temperatures of as high as 180 to 200 deg. F. have to be used in the primary dryers to attain 2 percent powder, even with preheating. The highest inlet-air temperature at which a dryer can be effectively operated is that which does not increase the fluorescence value of the resulting powder. Lowering of the inlet-air temperature without subsequent redrying means the production of either 5 percent powder or of a decreased output.

The redryers still under study are of two general types. In one type known as the Conrad dryer, powder from the primary dryer (with 4 to 5 percent moisture) is brought into contact with a current of air heated to 225 to 250 deg. F. This is done in such a manner that the powder is reduced to 2 percent, or lower, moisture content without being heated above 180 deg. F. In the second type of redryer, built by Food Machinery Corp., the powder with 4 to 5 percent moisture content is brought in contact with chemically dried air with a moisture-vapor pres-

"Vitamin Y" Puts New Pep in Steam Equipment

PERHAPS you've never heard of Vitamin Y. For the sake of this message, it stands for Yarway Impulse Steam Traps. But you have heard of Gelatin Products Company of Detroit—world's largest producer of soft, elastic gelatin capsules, and big factor in the production of the health and energy-giving vitamins which hold the center of the stage in public interest today.

And here is the connection. A Yarway representative in this company's territory writes: "A year or so ago they started using Yarway Traps after they had been called to the attention of the Fine Chemical Div. Soon they were using them exclusively in this division and throughout the rest of the factory.

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"In all, they have over 100 Yarways at work on heaters, stills, reaction kettles, unit heaters, etc.

"It would seem to me that we might play up the copy on the vitamin angle—vitamins to increase energy in the human body—Yarways always to increase the energy received from steam, etc., etc. With some thought we could make a catchy ad from this copy."

We think so too, but he could have mentioned that Yarway Impulse Traps usually cost no more to buy, than to repair an ordinary trap. Also that more than 350,000 have been purchased and over 100 convenient Mill Supply Distributors carry them. Why don't you see your supply house or write for Bulletin T-1739.

YARNALL-WARING COMPANY
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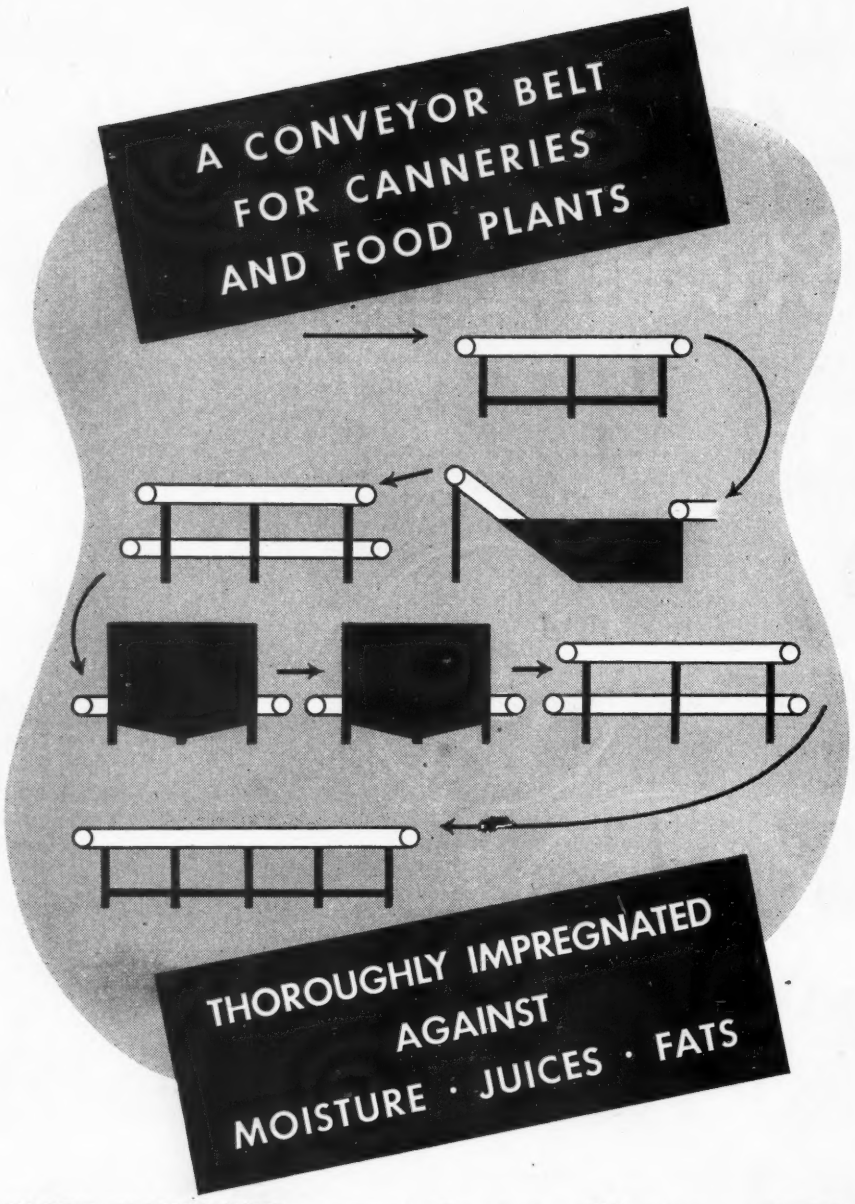

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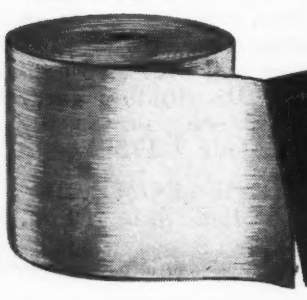


GLOBE WOVEN BELTING CO.
1396-1400 CLINTON STREET
BUFFALO, N. Y.

sure of less than 1 mm. of mercury. This is accomplished in a closed system of continuous-belt conveyors carrying relatively thin layers of egg powder and imparting a minimum of turbulence to the powder. In this type of dryer, the powder may not only be reduced in moisture content to 0.5 percent, or lower, but is also automatically cooled to the desired 80 deg. F., or lower. The rate of redrying and cooling is the same as that at which the 5 percent powder is delivered from the primary dryer, *e.g.*, 500 to 600 lb. per hour in contrast to 350 lb. per hour if a redryer is not used.

Pending the availability of redryers equipped with a closed cooling system, egg powder dried to 2 percent, or lower, moisture content requires special handling to get it from the 170 to 185 deg. F. dryer discharge temperature to the desired 80 deg. F. or lower packaging temperature with a minimum moisture pickup. On a production scale, cooling of low-moisture egg powder to 80 deg. F. is more difficult than drying it to the low moisture level. Powder of 2 percent, or less, moisture content is highly hygroscopic and has to be cooled and packaged with minimum exposure to room atmosphere.

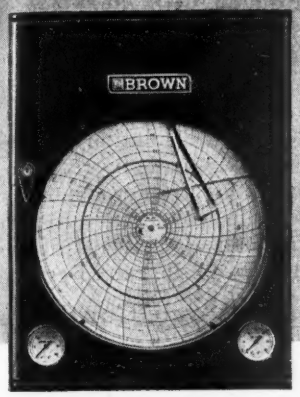
Cooler Design

Egg coolers of various designs and production capacities were described and discussed. In addition to the combination second-stage dryer and cooler, there were designs varying from the U-shaped, water-jacketed, stainless steel vat (15 ft. long by 2 ft. wide and equipped with a special agitator having a 1-in. clearance with the inner surface of the vat) to the vertical, closed-system air cooler equipped with an enclosed vibrating screen to bring the hot egg powder intimately and quickly in contact with the recirculating cold air and with a rotary discharge valve to permit continuous removal of the powder to the filler without exposing it to room air.

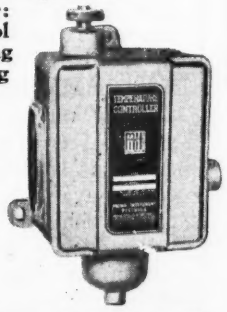
Because of the undeveloped status of cooler designs, a committee was appointed by Dr. Stewart and Captain Gelman to study them and make a report with recommendations.

While reduction of the moisture content of the egg powder to 2 percent or less increases the stability of the powder with respect to the sugar-protein reaction, there are other deteriorative changes which take place during storage periods even in eggs under hermetic seal. These defects still are being intensively studied by the Western Regional Research

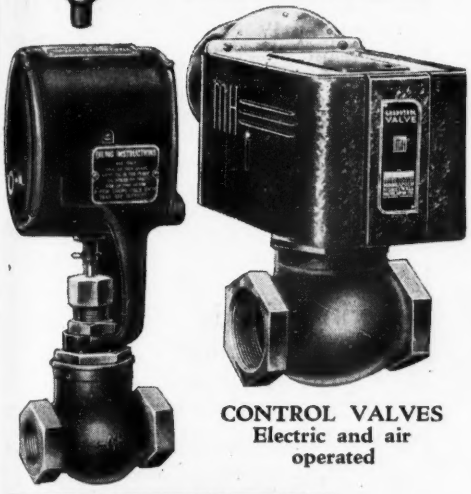
Brown Engineering Advances
PROCESS CONTROL



THERMOMETERS
Electric and air operated controllers for:
On-off control
10% throttling
Full throttling
Air-O-Line

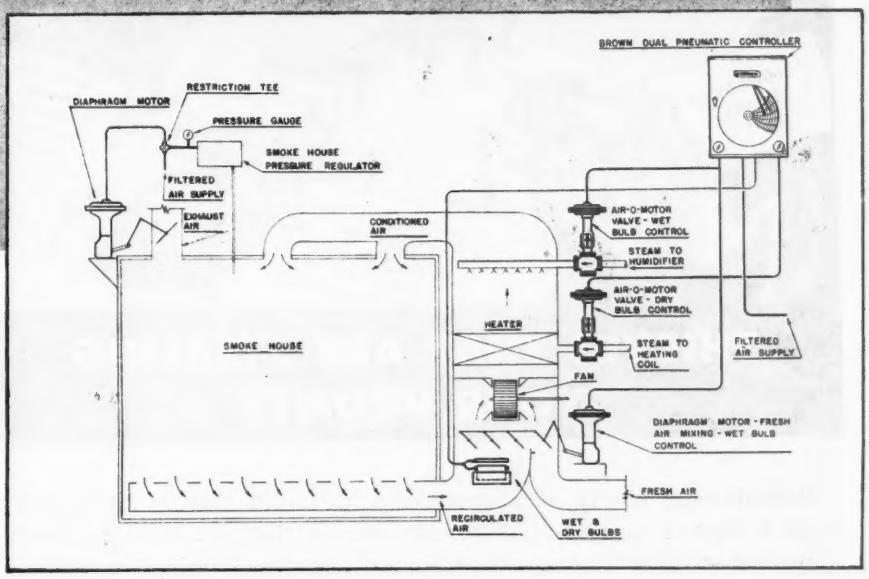


NON-INDICATING TEMPERATURE AND PRESSURE CONTROLLERS



CONTROL VALVES
Electric and air operated

ELECTRONIK-AIR-OPERATED POTENTIOMETER CONTROLLERS



—Instruments for Control of Air-Conditioned Smoke House

INGENIOUS instrumentation is characteristically Brown. Difficult measurement and process control problems which must be solved to increase production, increase efficiency, or lower cost are an interesting challenge to Brown engineers.

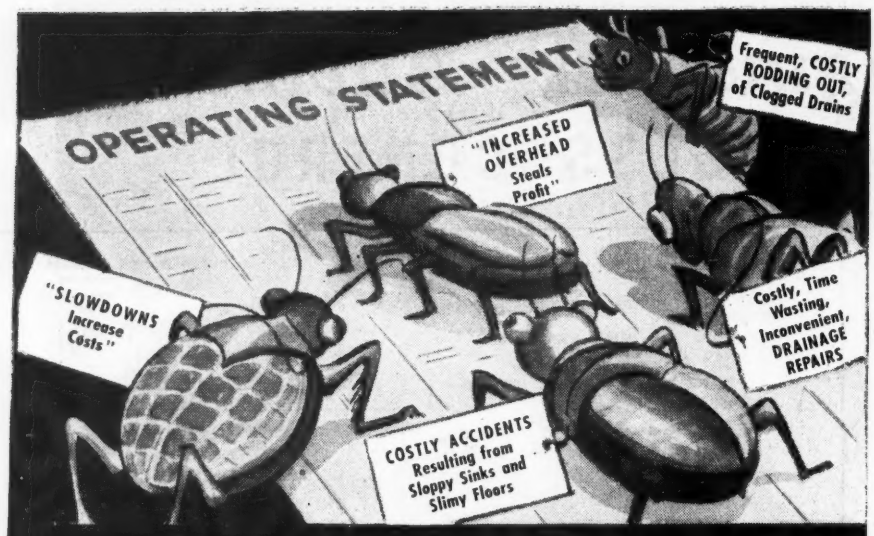
Their engineering training is supplemented with practical experience in the field of plant processing, and their recommendations are based on the thorough knowledge of your process requirements in the application of Indicating, Recording and Control Instruments. The above shows a typical example of a Control System for *smoke houses*.

Brown Instruments and Minneapolis-Honeywell Controls make possible the desirable advantage of centralizing remote measurement and control—they can be grouped on a centralized panel by means of electric, pneumatic, or combined electric-pneumatic transmission systems to permit complete command of all operations from the main control board.

For information write THE BROWN INSTRUMENT COMPANY—4502 Wayne Avenue, Philadelphia 44, Pennsylvania, a division of Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota. Offices in all principal cities. 119 Peter Street, Toronto, Canada—Wadsworth Road, Perivale, Middlesex, England—Nybrokajen 7, Stockholm, Sweden.

INSTRUMENTS BY **BROWN** CONTROLS BY

MINNEAPOLIS **Honeywell**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Frequent, COSTLY RODDING OUT, of Clogged Drains
"INCREASED OVERHEAD Steals Profit"
"SLOWDOWNS Increase Costs"
Costly, Time Wasting, Inconvenient, DRAINAGE REPAIRS
COSTLY ACCIDENTS Resulting from Sloppy Sinks and Slimy Floors

THIEVES THAT ARE STEALING YOUR PROFITS

Slowdowns; costly accidents resulting from sloppy sinks and slick floors! You can't see these thieves that are stealing your profits—they work in the dark. Inconveniences hatched in grease-clogged drain pipes are the thieves that sneak into the daily operations of your business and impede progress.

You can save yourself some worry and put an end to the toll these thieves take from you by installing a Zurn Greaseptor with the exclusive new Flo-Trol regulating device. A Zurn Greaseptor prevents clogged drains and costly repair bills, and puts an end to slowdowns or shutdowns due to grease-clogged drain pipes. It will help you to keep your business at top capacity all the time. A Zurn Greaseptor properly installed as near as possible to the source of grease-laden waste water intercepts, separates, and recovers drain clogging grease;—keeps it from clogging drain pipes, and causing costly delays and repairs. Zurn V.G.E. Greaseptors are easy to install, easy to clean, and assure free flowing drainage of waste water at all times. Easily installed by your maintenance crew or by a plumbing contractor, Zurn Greaseptors come in sizes adequate for all food processing plants. Ask a plumbing supply wholesaler about how the installation of a Zurn V.G.E. Greaseptor will help you conserve your profits. Mail coupon for information.

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▲ This is what happens to unprotected pipe receiving greasy waste-water.

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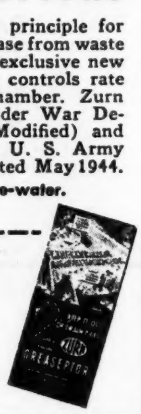


Laboratory under the immediate direction of Dr. Howard Lightbody. Another change appears to be the result of yolk protein deterioration or reaction with other egg-powder constituents. At the present status of the research program studies, lowering of the pH of the egg powder gives helpful results. An approach to the solution of the problem is being made by requiring CO_2 gas-packing after vacuumizing under 15 in. of mercury to leave not more than 2 percent of residual oxygen in a 3-lb. can of egg powder.

Research Continues

The coordinated research program has brought about a rebirth of large-scale production of dried whole eggs for QMC purchase, and powder of satisfactory quality and much improved palatability is now getting to the battle fronts in the Pacific war zones. But the program still is actively under way for the future study of eggs and their processing. Also, as additional equipment becomes available and plant practices can be changed to apply methods resulting from the research program, cost of production of the low-moisture powder shows good promise of decreasing as rate and quality of production increases.

The cumulative benefits of this coordinated cooperative research program are not restricted to the drying of whole eggs. They will be experimentally applied to the drying of citrus fruit juices, ice cream mixes and milk and are thought to have application in the drying of other juices, vegetable purées and soups.

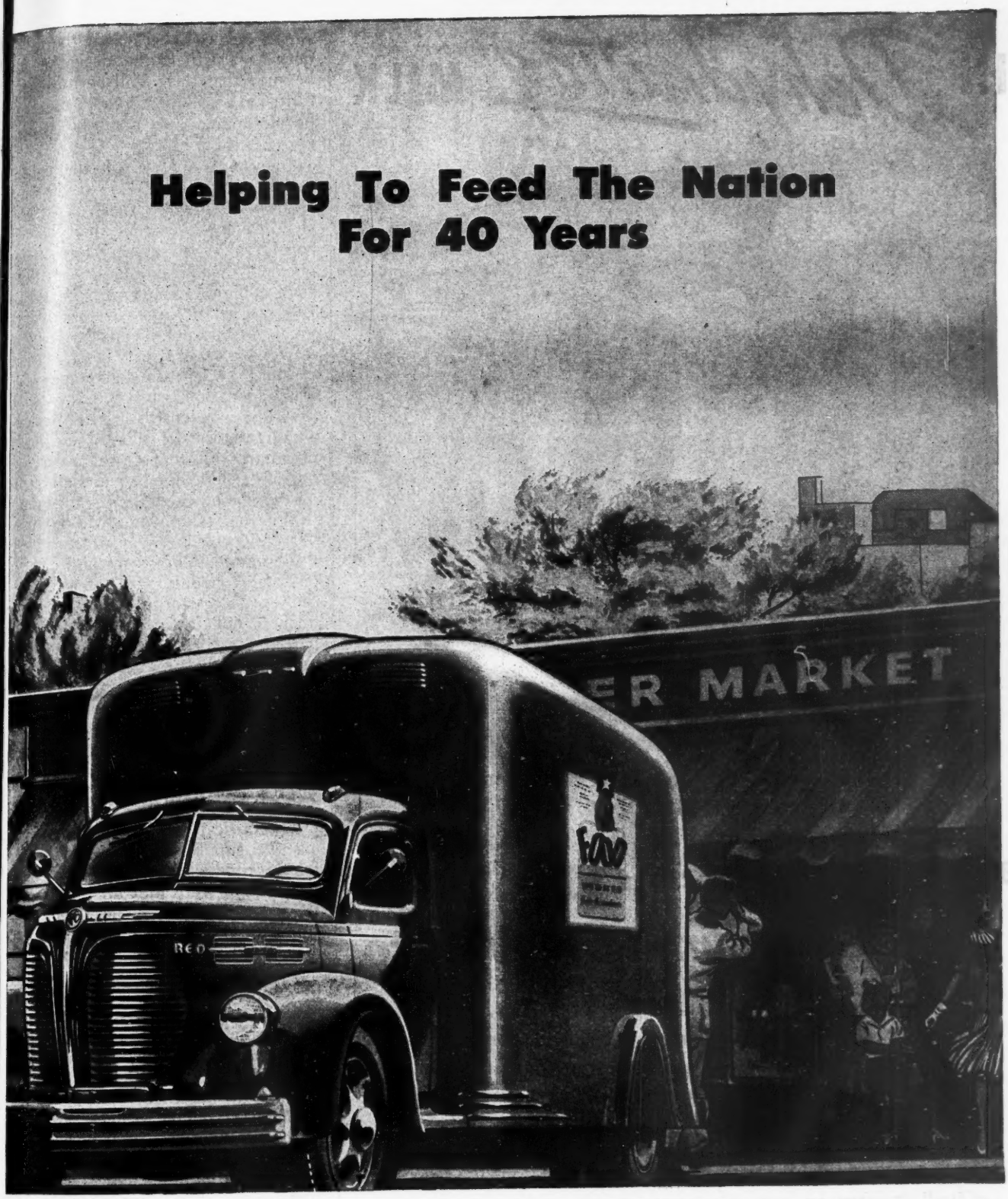
Drying Foods By Sublimation

(Continued from page 95)

taken into consideration, together with the amount of water vapor to be removed.

There is no advantage in using booster pumps, such as oil or mercury-diffusion or ejector boosters, unless they are designed for proper efficiency in the particular range of vacuum being used. This pressure range is usually above that for which, at the present time, effective simple boosters other than steam have been designed. If an attempt is made to carry the vacuum to a pressure below that corresponding to the temperature of the condenser surface (vapor pressure of the ice), little is gained because the pump

Helping To Feed The Nation For 40 Years



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Food fights for freedom . . . produce more, save more, share more . . . food is the essence of victory! For 40 years, Reo has helped haul the nation's foodstuffs from producer to distributor to consumer. Today, Reo produces for war—powerful trucks and tractor units that are helping to haul food and materiel to fighting men the world over. Reo is also planning for peacetime . . . meanwhile a limited quota of medium and heavy-duty Reo trucks has been released for civilian use in 1944. Ask your Reo dealer for full particulars.

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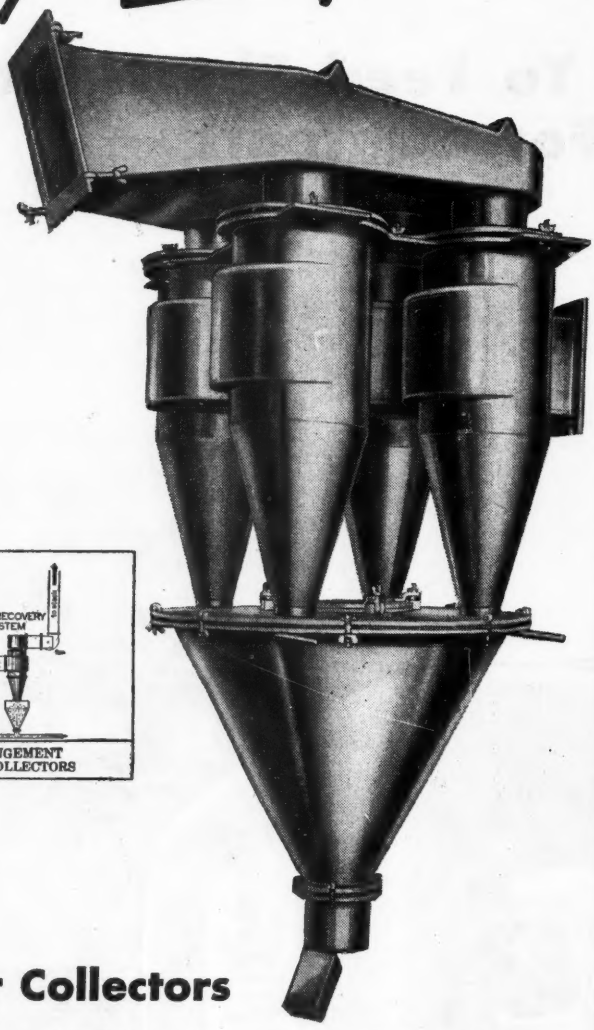

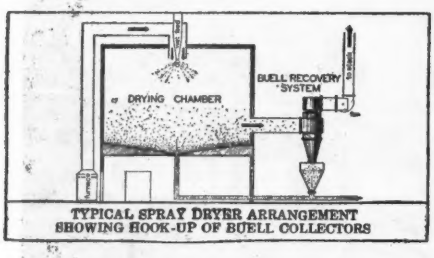

TYPICAL SPRAY DRYER ARRANGEMENT
SHOWING HOOK-UP OF BUELL COLLECTORS

Buell Powder Collectors
Eliminate Waste

It has been estimated that, without proper provision for recovery, as much as 15% of the milk powder from spray drying operations may be lost in the exhaust. Buell Powder Collectors eliminate this waste, quickly pay for themselves in savings. The material recovered by Buell Collectors is immediately and automatically returned to the regular production.

In spray drying milk, eggs, or any other food products, Buell Powder Collectors should be an integral part of the system. The rapid acceptance of Buell equipment by the food industry and its successful applications to the problems of dehydration are the result of Buell's leadership in dust recovery throughout industry.

For further information, write for factual 28-page book, "Bulletin G-842"

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DESIGNED TO DO A JOB, NOT JUST MEET A "SPEC"

simply removes ice from the condenser. Further, the design must be such that there will be no back-diffusion of oil or mercury from the booster pump into the product being dried.

In systems operating in the higher range of vacuum (25 to 50 microns), and where there is excessive leakage, boosters may be of considerable assistance, but it is only with inefficient condensers that such a high vacuum must be used. In systems of large size requiring great vacuum-pump capacity for air in a narrow pressure band, steam ejectors can be used advantageously in combination with the low-temperature condensers. The design characteristics in this case, however, are different from those required where the steam ejectors also are being used for direct pumping of the water vapor without use of refrigerated condensers.

The number of stages and of interstage condensers to be used in the steam-ejector design depends upon several factors. These are the partial pressure of water vapor required for the product in question, the relative costs of steam and cooling water and the temperature of the latter, as well as other design characteristics which affect the efficiency.

Drying Without Thawing

The critical relationships governing the supply to the evaporating frozen product of latent heat for sublimation were first mentioned in 1935.[1, 7] The faster heat can be supplied, the faster drying can be carried on, but the temperature of the product must never rise above its melting point. Vacuum shelf dryers of the type illustrated in the accompanying picture are excellent when they are designed for circulating a heating medium with uniformity through the jackets and through the hollow shelves. In this way, the latent heat of vaporization may be supplied rapidly and under controlled conditions. In some circumstances, it is even possible to use steam at pressures as high as 40 lb. per square inch without melting the frozen product. But, as drying nears completion and there is less evaporative cooling, the high temperature of the heating source must be lowered so that the final dried product is not taken above a proper limit. Heating fluids other than steam, of course, may be used.

Infrared radiation may be used, as well as dielectric heating, but there are limitations with these. In

Faster Cooking With Less Steam

WEBSTER SERIES "78" DIRT STRAINER AND SERIES "78" TRAP ON EACH FLASH PASTEURIZER

Food Plant Operators often needlessly limit the capacity of steam-using equipment. Installation of proper traps pays big dividends in food processing. Saves precious fuel. Adds to daily output by quicker heating-up.

The Webster Series "78" Trap assures quick, continuous and automatic removal of both air and condensate from the steam chamber of *each* unit. There's no escape of "live" steam in the returns . . . no air-binding or water-logging of equipment.

The application of a separate sturdy, long-service trap to *each* piece of equipment is recommended by Webster Engineers. This is more efficient than the old-fashioned method of a master trap for a series of processing machines. You'll find that these traps will soon pay for themselves through savings in steam and time.

Your nearest Webster Representative can give you more detailed information on your problems in increasing present output. Consult your local telephone directory for his address. Or write us direct for Bulletin B-1200E. Address Dept. FI-12.

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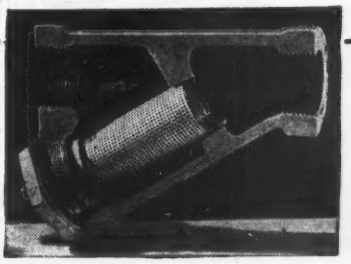
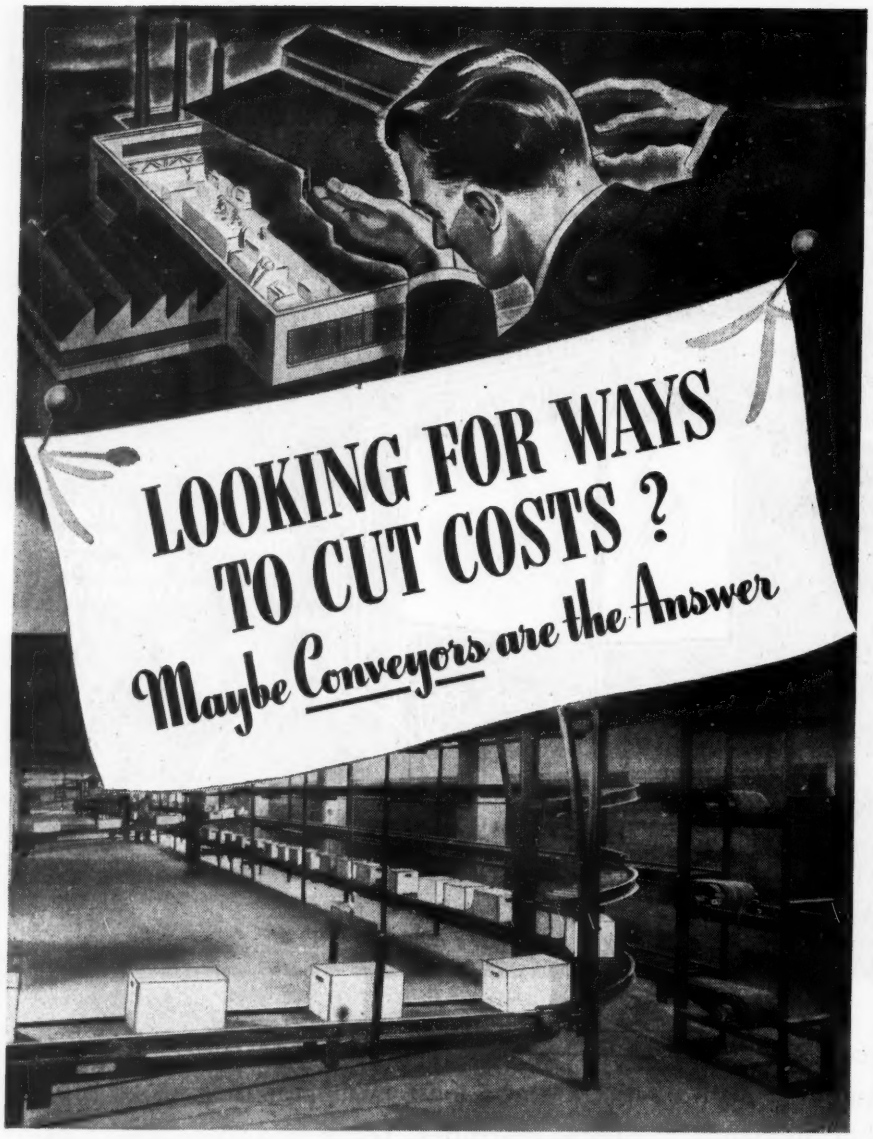
Webster Dirt Strainers protect Traps against pipe scale, dirt and sediment. Basket easily removed for cleaning.





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the first place, the high cost of electrical power as a source of heat is usually found not to be commensurate economy. In the second place, radiation does not readily penetrate ice or the dry layer of the product, so that there is no great gain in efficiency.

Speed of Drying

It is self-evident that water vapor must be carried off rapidly to give fast drying. By use of an adequate condenser or of a properly designed steam ejector, this is readily enough accomplished. The controlling factor then becomes one of rapid transfer of heat to the frozen product to cause rapid evaporation; otherwise, the vapor pressure of the frozen product is not maintained at the optimum point. In this there are limitations.

Heat must not be supplied to the product faster than the ice can conduct it to a free surface at which evaporation can take place. It is at this latter point that the heat is utilized and evaporative cooling results. Heat may be brought directly to the evaporating surface to avoid conductance through the ice, but as soon as sublimation has proceeded to an appreciable extent, the ice layer has receded from the original level and is covered by an outer layer of dried product. Then the heat must be carried across this porous outer structure of dry material in which there is no cooling. If high-temperature heating sources are used, this is not readily done without raising the temperature of the dry portion above a safe level.

Radiant sources of energy do not assist materially, inasmuch as radiation does not readily penetrate the solid matter. Even with the generation of heat within the frozen mass, as by dielectric heating, it has not been possible to solve the problem. In the first place, as a practical matter in application of dielectric heat, arcing exists at all pressures lower than one centimeter or 10,000 microns. This pressure is too high for drying by sublimation. In the second place, heat must not be generated within the frozen mass at a rate in excess of that at which the heat can be conducted through the ice to the evaporating ice surface where it is utilized, otherwise a pool of molten product would be formed within the mass of ice.

All of this means that the ultimate speed of drying is determined by, and is limited by, the speed at which the heat of sublimation can be carried to the ice surface where it is required.

Remember THIS WHEN YOU NEED Good Valves

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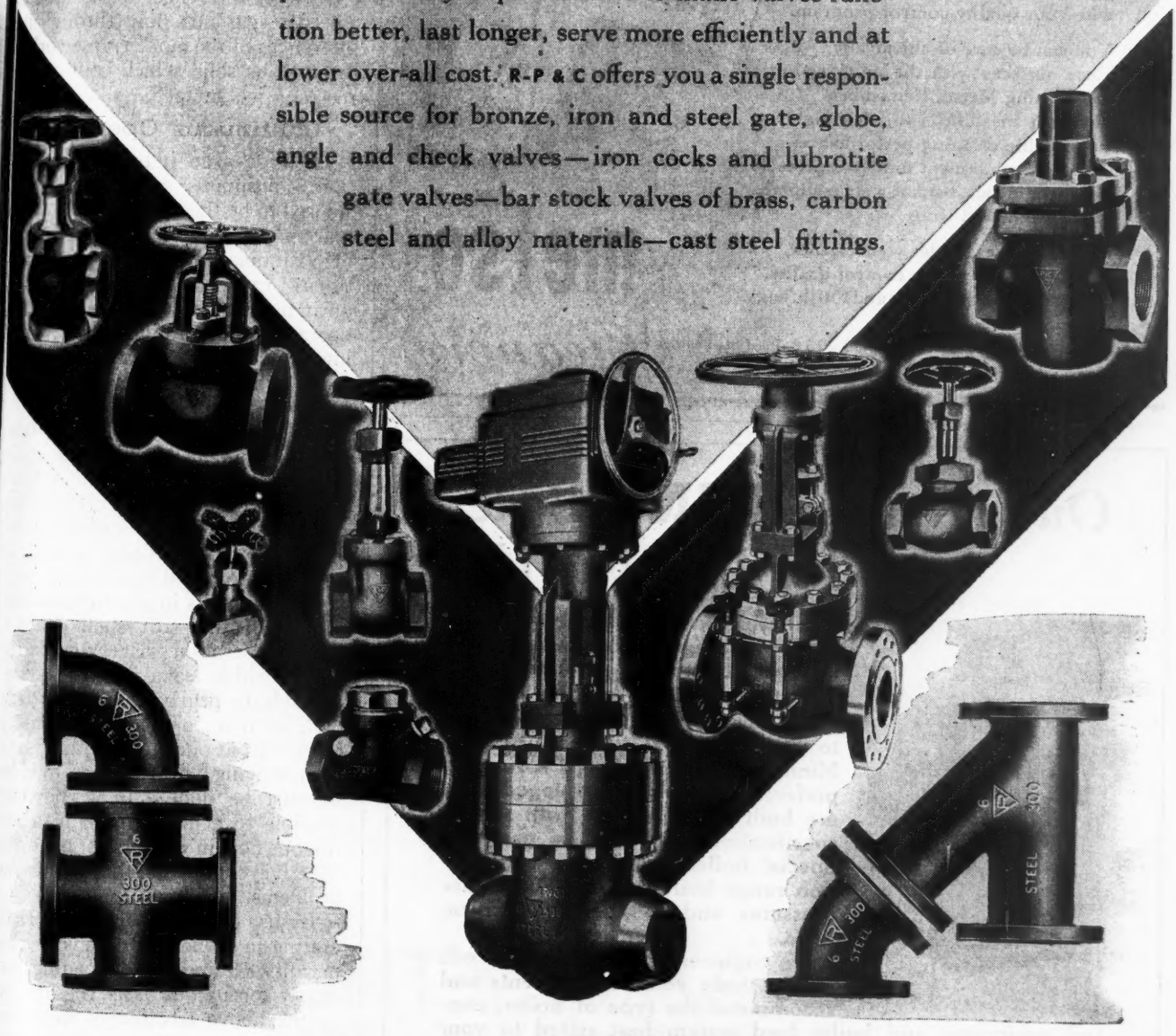

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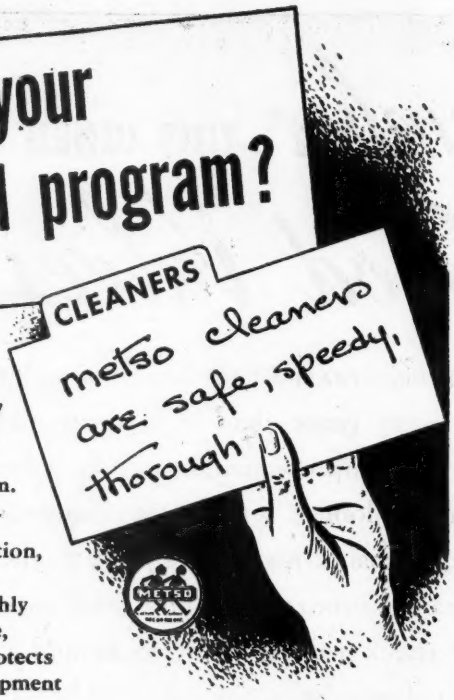
is cleaner on your quality-control program?



Your best efforts to guard purity and uniformity can be nullified by the thinnest film of grease. Thus, your cleaner must keep pace with your quality-control program.

You can be sure of chemically clean surfaces with the quick-action, free-rinsing Metso. Remember also that in addition to thoroughly dependable cleaning performance, a special component in Metso protects sensitive metals, so that your equipment stays bright and shiny.

When you next order your cleaner, let Metso help you to control quality. Packed in 300 lb. barrels and 100 lb. bags.

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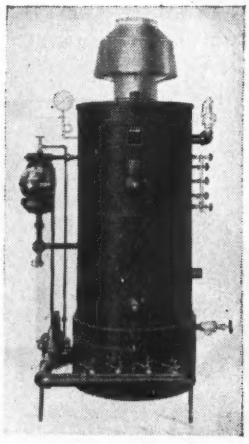
Our Famous **KANE** *Boiler* . . . for Postwar Use



This well known, highly efficient boiler is designed to save the user money. Automatic, gas-fired, it has everything you are looking for in a boiler to supply process steam—sizes to 30 H. P.

Minimum attention keeps it running perfectly. Regularly cataloged sizes are built in accordance with ASME specifications for 100 lbs. pressure. Special boilers within our construction range built to order for higher pressures and to special specifications.

Our engineering department will gladly study your requirements and recommend the type of boiler, control equipment and boiler feed system best suited to your plant.

Our experience of more than a third of a century in this type of work is at your disposal.

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Further, this limitation is one of conduction through poor conductors. When heat is applied rapidly to a product during sublimation, measurement of the temperature at different levels throughout the frozen layer reveals that there is a considerable temperature gradient from the outside surface down to the ice surface where evaporation takes place. For these reasons, beyond a certain point more efficient condensers or pumping systems of greater capacity or higher vacuum cannot increase the rate of drying. The optimum conditions for each of these factors already have been discussed, particularly with reference to the laws of adiabatic gaseous flow through the interstices of the outer framework of dry porous solid which confines the receding ice surface.

Continuous Operation

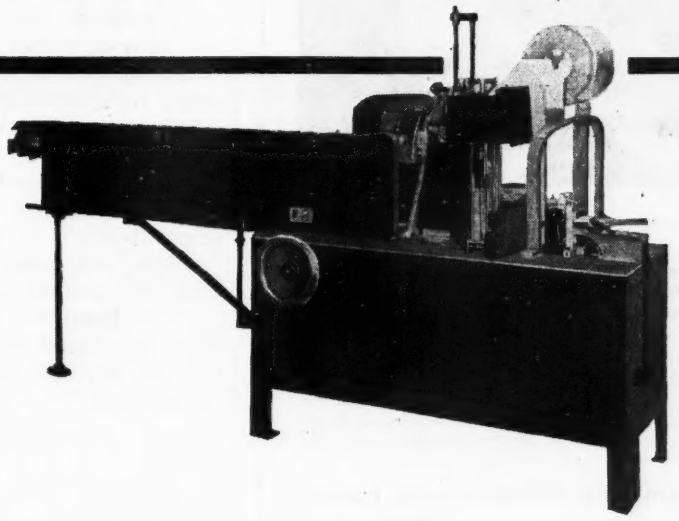
In large-scale industrial production, continuous operation is considered to be the ultimate goal. The reasons for this are several, including: Elimination of storage of quantities of raw product between batches on an uneven flow (such as in juicing operations for orange juice), to allowing packaging operations to proceed with uniformity and reduction of labor.

In drying of sublimation, however, continuously operating equipment involves more than ordinary problems in mechanical engineering. Generally speaking, stuffing boxes and other moving parts under high vacuum provide difficulties in maintenance. Leaks in any high-vacuum system of this sort spell death to smooth operation. Every cubic foot of air which leaks into the system expands to nearly 2,000 cu. ft. at high vacuum, and all this must be exhausted at once by the pumps. If such moving parts can be avoided, it must be done. It is, however, possible to achieve virtually a continuous flow in what might be termed "batch cycling," and this avoids such problems.

By use of a number of dryers operating in sequence on a cycle which permits loading and unloading on a nearly continuous basis, the first two of the above advantages in continuous operation are met. By providing automatic filling of the drying chambers prior to freezing and drying, together with mechanical means for unloading, labor is reduced to a low point, lower than in fully continuous operation if maintenance is considered.

The reliability and simplicity in mechanical operation of the high-

Sandwich Manufacturers Welcome New High-Speed Wrapping Machine



Moisture-tight fold.

FOR years the cracker sandwich makers have been searching for a high-speed machine which automatically wraps, heat seals and affixes labels. They wanted it to step up production, save manpower, use less cellophane, and to turn out a neater moisture-proof package with improved sales appeal.

Affixes labels on ends.

They've found it in Wright's new high-speed sandwich wrapper. The machine was designed primarily to handle the standard five cent peanut butter cracker type sandwich, round or square, and may also be adapted for wrapping fig bars, cookies and other similar products.

All machines which can be made with materials allocated to us for 1944 have been sold. Contracts now being discussed are based on 1945 material allocations.

Complete visibility.

If your company has not investigated this promising, new machine write and we will send you latest information.

WRIGHT'S *Automatic Machinery Company*

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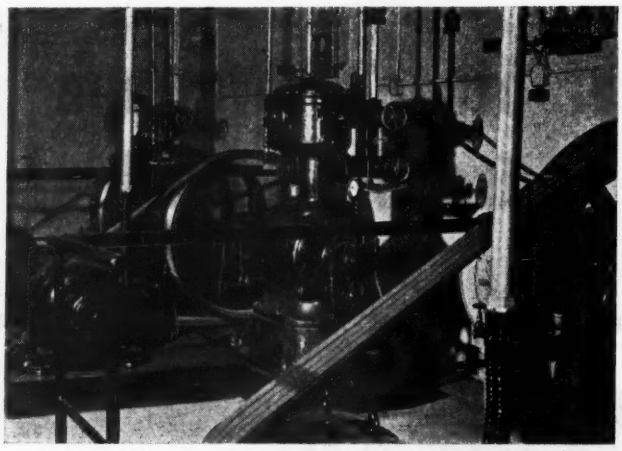
"Specialists Since 1893 In Putting Labor Serving Ideas Into Action"



Big Naval Air Training Center uses

Sixteen thousand people at the Norman, Okla., Technical Training Center create a "hunger load" that demands food in great quantities. Three Frick ammonia refrigerating machines, and 18 Frick air cooling units, cool the many rooms (some at moderate temperatures and some at low) in which all this food is stored.

Find out what Frick Refrigeration can do in your plant. It is adapted to practically any cooling service—air conditioning, ice making, quick freezing, processing, etc. Write for literature and estimates.

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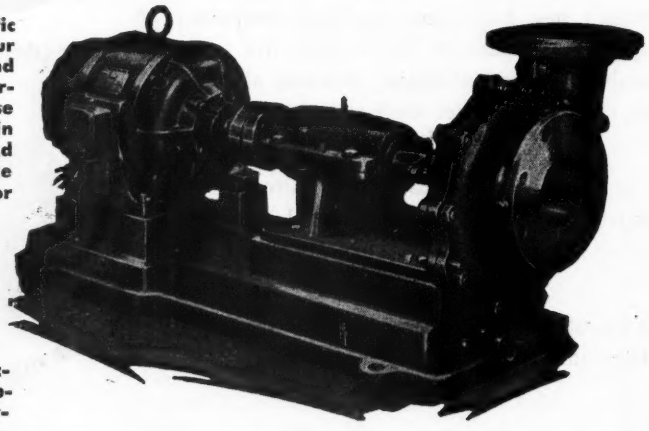

Studying the specific requirements of your particular industry and applying our engineering skill to meet these specifications, results in a product designed and built to fulfill all the necessary conditions for "making-good" in your own plant.

We will guarantee the satisfactory performance of Frederick Pumps for any specific service, if the prospective purchaser will supply us with the following information:

Conditions under which your pumps must work.

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Frederick has been making fine pumps for over 25 years . . . our engineering consultation is always available.

For dependable pumps . . . we invite you to investigate the performance of "FREDERICK" PUMPS in other food producing plants. Write for full information.

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Over 25 years' experience in the making of fine pumps

vacuum equipment used in batch cycling offer the strongest challenge to any piece of equipment which introduces precarious mechanics. In addition, this type of equipment greatly simplifies the problem of rapid introduction of heat into the frozen material without harm to it.

Final Moisture

For the best keeping qualities, it is imperative that moisture content be reduced to below 2 percent, and preferably to 0.5 percent. This is true regardless of the method of drying. But in carrying it out from the frozen state, we have available a means of achieving such low content of moisture without harming most foods. To achieve this low moisture by other means requires that the product be taken to excessive temperature. The general porosity and nature of the product obtained by sublimation makes this stable condition readily attainable.

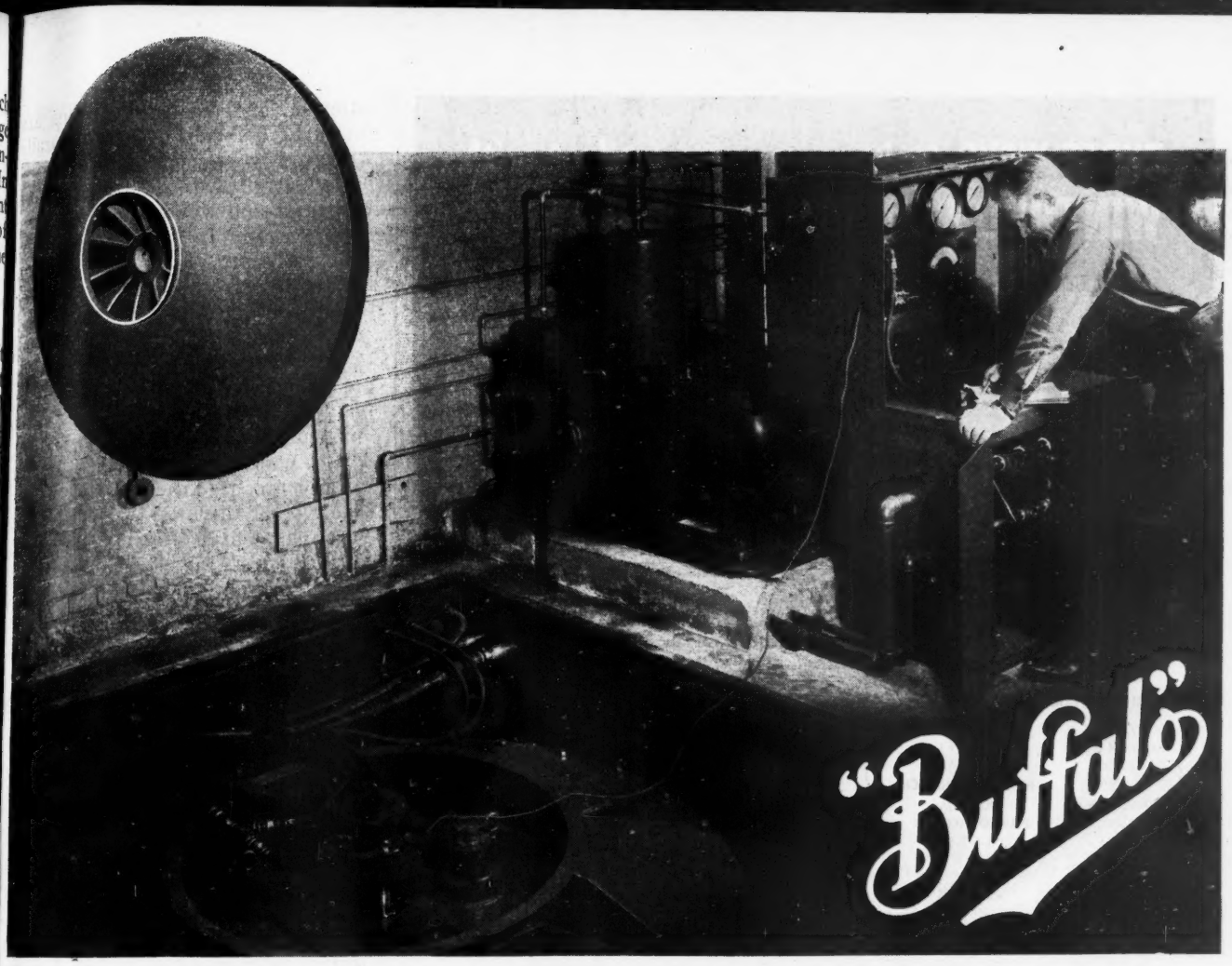
Packaging

Most products after drying by sublimation are extremely hygroscopic. For this reason, it frequently is necessary to have single-use packages. During the packaging operations, air-conditioning must be used with adequate reduction in humidity to prevent excessive absorption of moisture. The final package must be of a hermetically sealed type. Cans, jars with proper seals or certain metal-foil packages have been found suitable.

Many of the products are entirely stable when sealed under air, provided practically all moisture is excluded. But products containing fats or lipoids must be sealed either under vacuum or in inert gas, because oxidation proceeds even in the absence of moisture.

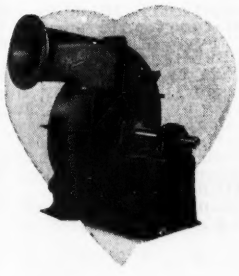
Cost

The cost of drying by sublimation naturally varies with the product in question, the solids content, temperatures required during drying, and the like. With products of relatively high value, such as orange juice and meat, the cost of drying is low in relation to the combined cost of the raw material and the cost of preserving by methods which do not yield a high quality product, A major item is the amortization of the drying plant. In Table I is shown an itemization of the costs involved directly in drying orange juice. In Table II is shown a schedule of the total costs for producing the final product, including packaging as for institutional, restaurant or military uses. In this



Insert shows new all-welded rotor of high pressure Buffalo Blower. Large illustration shows Vacuum Test Pit.

TEST PIT MAKES NEW HI-EFFICIENCY, HI-SPEED, ALL-WELDED WHEELS POSSIBLE



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"Fan Engineering"— the air Engineers' Handbook — 740 pages of useful data. Price $4.00 Postpaid in U.S.A.

For many years, fan manufacturers have been limited by the unknown speeds at which fan rotors will fail. Because high speed fans are not ordinarily sold in quantity, cost of testing single rotors has been prohibitive. For example, to test a 36 inch rotor at 2,000 rpm requires 50 hp., at, say, 4,000 rpm, the horsepower mounts to 400. Step this speed up to 8,000 rpm and 3,200 hp. is required. Larger wheels, of course, run proportionately higher.

Because of this, fan manufacturers have in the past wisely kept speeds well below the theoretical limits, so that wheel failures have been infrequent. Sometimes maximum efficiency has been sacrificed because of this fact.

"Buffalo" engineers, dissatisfied with this method of design, built the vacuum test pit where rotors are tested to destruction in an almost perfect vacuum. Because there is no air resistance, rotors may be operated at speeds up to 60,000 rpm. In the pit, horsepower requirements, exclusive of bearing friction, are only 1/4000th of that required in the atmosphere.

As a result of experiments "in the pit" Buffalo now offers new high pressure blowers and higher pressure centrifugal compressors. These have newly designed rotors some of which are all-welded. Efficiency is high — maintenance costs are nil, and the user can be sure of fine performance on the job.

Your requirements may never call for high pressure fans, but when you buy even a desk fan, it's nice to know that the manufacturer is leading the field in the search for better products.

"Buffalo" engineering sales representatives located in all principal cities will be glad to give you full information about Buffalo fans and air conditioning equipment—call them.

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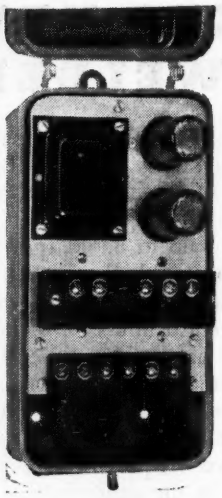

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prevents overflow waste and emptiness damage. Operated by electronic action, the FARATRON signals or controls the level — high or low — of any kind of liquid at any temperature, in any type of container or processing machine, either open or closed, free or under pressure.

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latter table, most of the items are for other than drying and naturally will vary with individual plants—particularly overhead—as well as with cost and type of fruit in any given season.

There is prospect of reduction in the total cost of operation of these plants for juices as market demand for the product increases. The item of amortization can be reduced by increasing the output of the drying plant through drying a concentrated juice instead of straight-run juice. Most concentrates, even when freshly prepared, are of such poor quality that there might seem to be little reason to dry them. However, by a new method of concentrating by freezing out of ice crystals and centrifuging, a satisfactory concentrate of 3:1 or 4:1 has been obtained, and this has good quality when dried. Enough of this for a full year's operation of the drying plant can be prepared during the season and held in the frozen state. In this way, up to six to eight times greater annual production is obtainable than that on which Table I and II are based. The interest and amortization of the drying plants will then be reduced to about 2 or 3 cents per pound of crystals. Production costs for drying would be reduced to about 4 cents per pound of dry powder. This holds promise as a ready means of expanding the production of present drying plants, and with reduced cost.

References

1. E. W. Flosdorf and S. Mudd, Procedure and Apparatus for Preservation in "Lyophile" Form of Serum and Other Biological Substances, Journal of Immunology, vol. 29, 389-425, 1935.
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3. J. Reichel, U. S. Patent 2,166,074.
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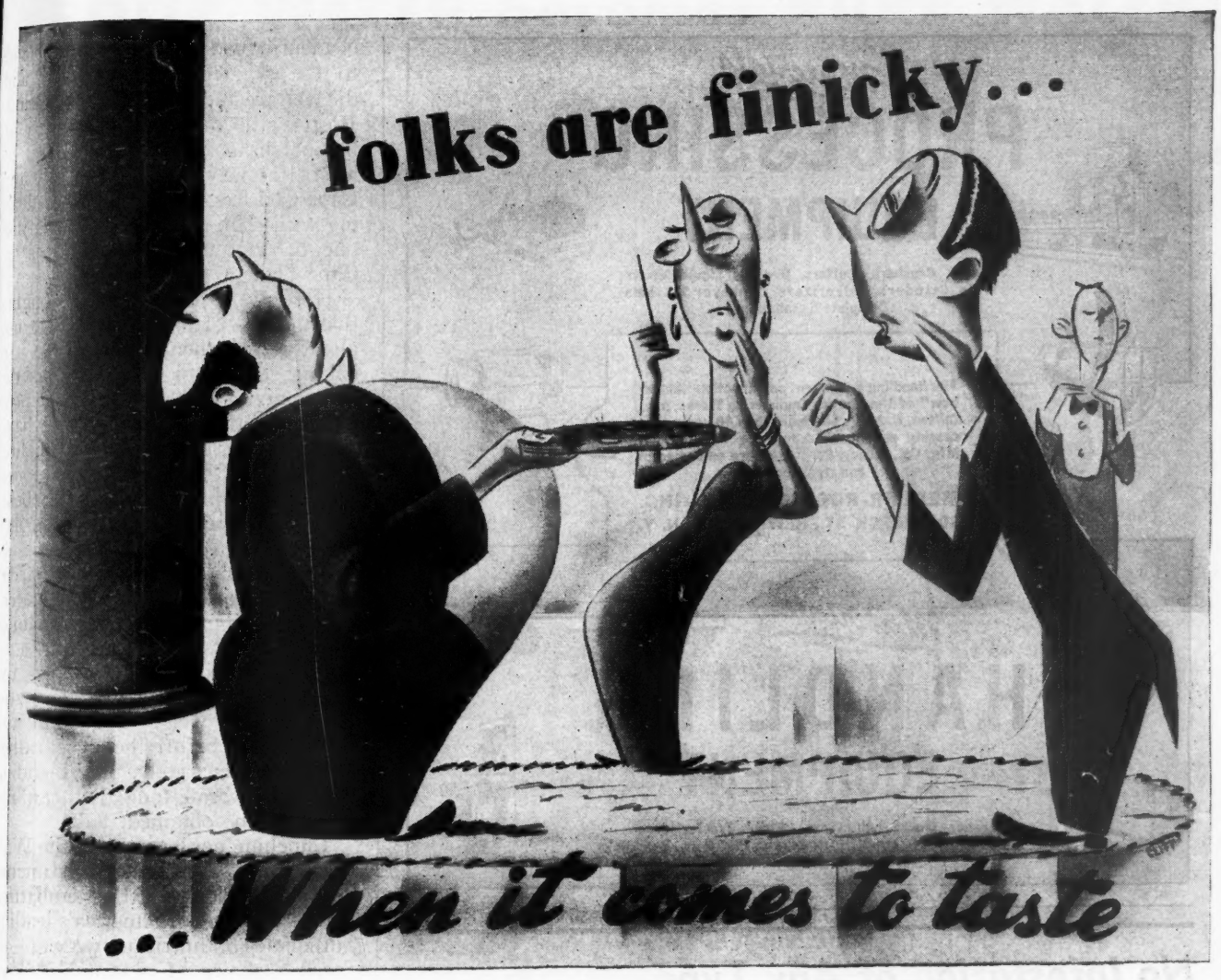
The Philosophy Of a Cook

(*Continued from page 77*)

if it looked good or tasted good or smelt good or felt good. They were a dull and dreary lot, and England was well rid of them. After three hundred years we still suffer from their mental and spiritual constipation. America abounds with the scattered foci of fine cuisine. The Swedes, the Dutch, the Negroes, the Creoles, the French, the Russians, the Chinese, the Spanish, the native Indians all brought to us the best they had—but nowhere in this fair land do all of these



People shop around these days till they find a food they like. They'll try anything once, and if they like it, they'll try it again. If you've pleased them with the flavor of your products, take every precaution you can to be sure that taste is **always** the same—that it doesn't vary from batch to batch.

Let Stange's 40 years of leadership in creating uniform seasonings be **your** guide in standardizing the flavoring strength, purity and color of the foods you make.

Stange's exclusive process of flavor extraction gives you Cream of Spice seasonings for flavor control in a concentrated, easy-to-use form that will never vary, that dissolve instantly, and eliminate excessive mixing. There is a Stange seasoning for all seasoned products packed in glass or tin. Or let the Stange technical staff develop your own fixed flavor spice formula, tailor made for you and you alone, a seasoning that requires no further blending after it gets into your hands. Ask your Stange representative for full details.

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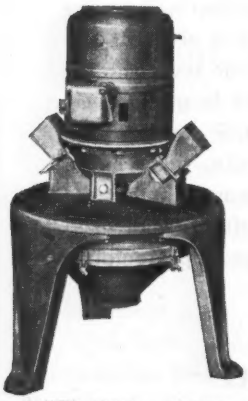

"ENTOLETER" shown above handles 15,000 lbs. per hr. Also in sizes to handle 2,000, 5,000, or 10,000 lbs. per hr.

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The "ENTOLETER" is the new, positive method of insect control. Its mechanical action destroys all forms of insect infestation in flour, cereals, spices, granulated, powdered and similar free-flowing dry materials, before processing and in the finished product before packaging.

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CONTINUOUS DESTRUCTION OF ALL INSECT LIFE

elements fuse and meld and blend to the greater grace of God and the welfare and pleasure of mankind. Boston still knows only one way of baking beans, when there are at least fifty ways that are better, and Cape Cod has only one way of dealing with clam chowder. That's just one of the minor misfortunes of Cape Cod.

Here are a few random thoughts that may be of use, if you have not already had them yourselves. In baking for instance, vanilla has the same universal importance that pepper has to the meat packer. I have yet to find a better way of dealing with vanilla than the old fashioned method of imprisoning a vanilla bean in a jar of sugar. Try for variety in seasoning baked goods such as buns, where a combination of cardamon with cinnamon may be alternated by a combination of cinnamon and coriander.

Most combinations of spices for large-scale seasoning will be better if accurately weighed, ground and then blended before their use, rather than added separately. The blending gives an overall tone that can not otherwise be obtained.

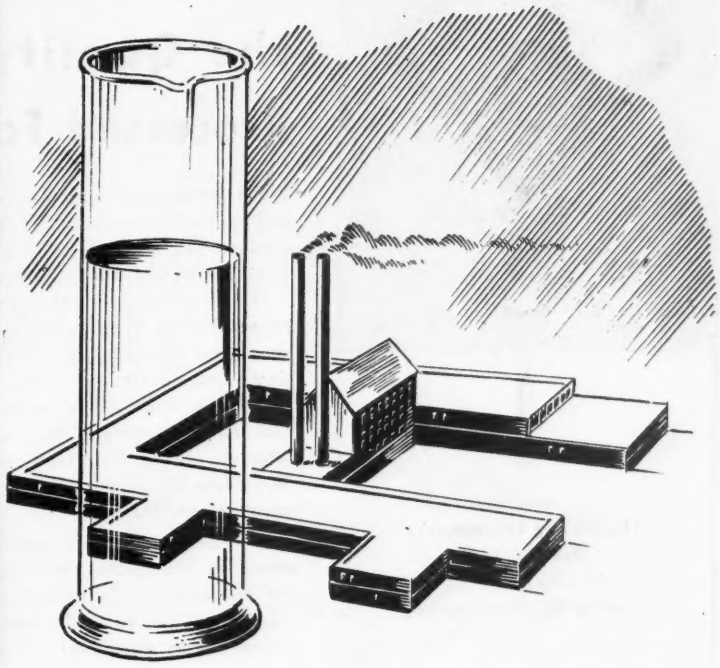
Lunching not long ago at the Waldorf's Men's Bar—that last unconquered bastion of the embattled male—with one of America's leading authorities on nutrition, we were offered a choice of peanut butter or apple butter as a substitute for butter made from cream. My friend said "I'll take apple butter. I know peanut butter is more nutritious, but I *like* apple butter." There, as it were, in a nutshell, is the whole story.

Incidentally, I might suggest to you that in questions of flavor and seasoning you make greater use of the advice and help of your spice supplier or grinder if he is sapient or, indeed, of the American Spice Trade Association itself. The united wisdom and experience of the various members of this Association might well constitute an encyclopedia of the palate.

Message for Packers

For meat packers I have a message that is close to my heart and to the heart of every American who likes his dish of ham and eggs. After all, ham and eggs is an American's inalienable right that should have been, but was not, guaranteed by the Bill of Rights along with freedom of speech and of religion. As the transformation of the right or left hind leg of a pig into ham is not only a matter of preservation but of flavor, I feel free to speak on this subject. The scientist in his labora-

POOR WATER *becomes* PURE WATER



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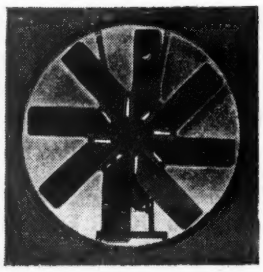

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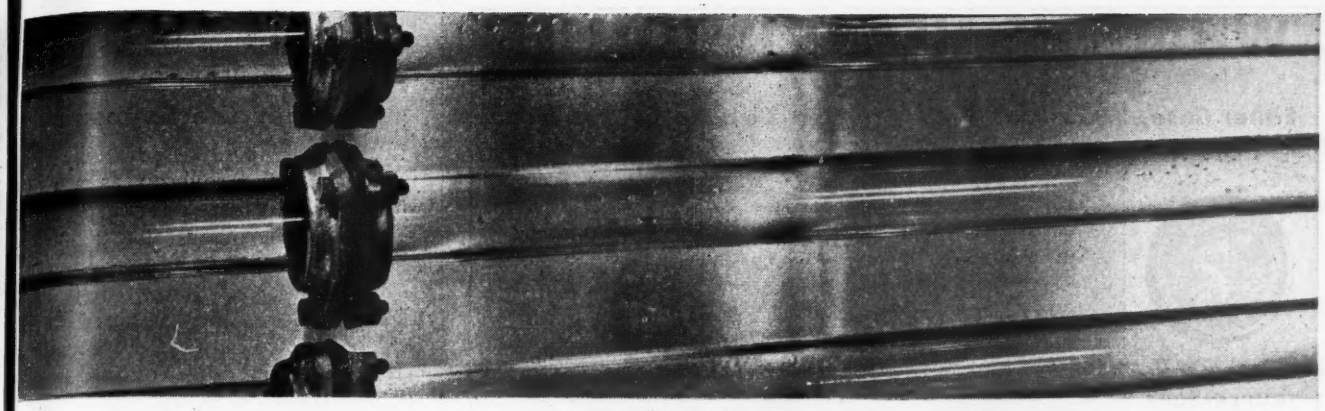
tory developed not so long ago a method of speeding up the process of pickling a ham by pumping through the arteries a saline solution that would cut the pickling process from weeks to days. Now this process is of high use if it is not abused. If it is employed merely as a Bedeaux, or hurry-up, system to turn out a ham in the shortest possible time, it will be one of the major curses of civilization rather than a blessing. If meat packers will use this gift of science to reasonably accelerate the curing process—giving time for the development of the amino acid flavors generated by mysterious inner chemical reactions and then embroidered and laced with real smoke, not the synthetic smoke of phenols, wood-tars, formaldehyde and aliphatic acids—you and I can well rejoice that a great national institution has been, like Williamsburg, saved from deterioration and ultimate decay.

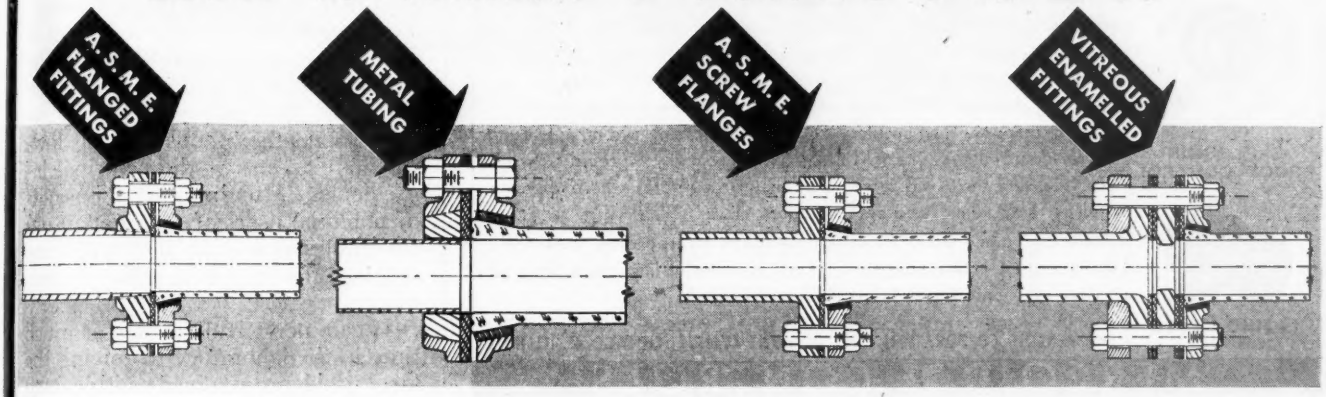
Cheesey Cheese

Just for the record, I am going to make another note or two that mark the boiling point, either centigrade or Fahrenheit, of personal vexations. I don't like processed cheese and I don't care who knows it. I am willing to admit that processed cheese has a keeping quality that endears it to the pockets of processors, jobbers, brokers, wagon distributors and finally to the retailer. It has nothing else to recommend it. Just nice, chewy "latex" with a faint, far-off reminiscent touch of butyric acid. My children eat it. Your children eat it. Unless something is done to curb this sacrilegious practice, the present generation will grow to maturity as consumers of processed cheese without the remotest notion of the delightful civilization that dwells in a slice of well-ripened American Cheddar, or almost any other cheese that has not been subject to the curse that bears the name of Pasteur.

There is one other small matter that from the point of view of taste I would like to bring to your attention. It is no less than the soybean, *Soja hispida*, as it is called by its friends and intimates. It constitutes one of the most valuable of nature's beneficences to man. Originally of Oriental origin, it came to these receptive shores of ours over a hundred years ago. Today, I am told that America produces more soybeans than China, Manchuria, Korea and Japan all put together. What has American mass production done with this divine gift of protein for the



How to connect PYREX PIPE *to*



You can easily join Pyrex Pipe anywhere in your existing line. You can get tight, leak-proof connections to whatever piping or equipment you are now using—pipe lines, valves, pumps or tanks.

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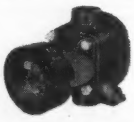
THE SWITCH IS TO A CONTROL
Either Case, When One Fails All Else Ceases To Function

TEMPERATURE AND PRESSURE CONTROLS

EXPLOSION PROOF CONTROL



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The relative importance of a switch is sometimes overlooked, especially in an automatic control. In the event of a switch failure, as in the case of a boiler pressure or temperature limit control, as well as other important applications, the failure may prove hazardous and costly. That is why from the very beginning, Mercoid Automatic Controls were equipped exclusively with the now famous hermetically sealed Mercoid mercury switches, known and used the world over. They provide an electrical contact designed for millions of perfect operations —one reason why Mercoid Controls are noted for their long life and better performance. Mercoid switches are immune to dust, dirt, moisture or corrosion. They are not subject to open arcing, pitting or sticking of the contacting surfaces. That is the reason why Mercoid Controls are following the Army in some of the far outposts where adverse and extreme humid weather conditions exist.

There are many other important features incorporated in Mercoid Controls, but in the meantime, remember the all-important Mercoid Switch—the unfailing heart of Mercoid Controls.

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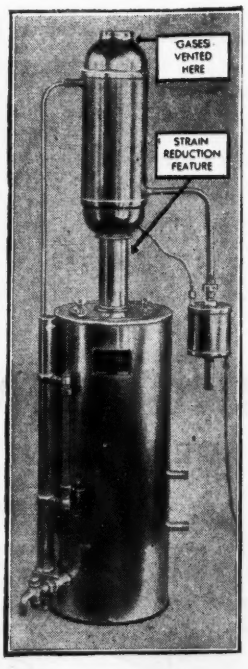

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poor, the unfortunate, the underfed? I'll be glad to tell you what commerce has done with and to it.

Consider the Soybean

Commerce became primarily interested in the soybean as a rich source of oil valuable for many purposes. So the oil was taken out of the bean, leaving a residue high in protein value but of extremely unpleasant taste. This defatted flour had been used as a food for cattle. Here's the tragic part of this story. When, not so long ago, a shortage of protein developed, the idea was promulgated of using this low-fat soya flour to make up this deficiency. The notion was a pious one, but it failed to take into consideration the human palate, which went into open revolt at the unsavory quality of soups and other foods bearing low-fat flour as one of the principal ingredients. Hundreds of thousands of potential users of soya got an unfavorable impression, which perhaps will be difficult or impossible to overcome.

If commerce had devoted as much time in the laboratory to solving the taste problems involved as it devoted to almost every other aspect of the soybean, the story could have been quite a different one. The soybean, understandingly and sympathetically handled, can be just as palatable as any legume. That it is far more nutritious than any other legume, no one will dispute.

At Least a Start

It is pleasant to note that one of the big food companies has brought out a tasty jar of mustard augmented by horseradish, a welcome change from the products to which most of us, for lack of something new, have become accustomed. It gives me real satisfaction to see, upon the shelves of fine and well-managed grocery stores, bottles of vinegar flavored with tarragon and shallots and garlic and with mint. These are all signposts that point to an assured future for flavor in American food, both domestic and commercial. Revolutions of any kind, whether of flavor or of politics and economy, start at the bottom, spread and then leaven the loaf of bread that we call life.

Outside and beyond the exalted but belated notion that I sometimes have of becoming personally and of myself a technologist or chemist of food, one who has under his command the welfare of the palates as well as the bellies of his fellow men, I can imagine nothing more creatively useful than to have been the

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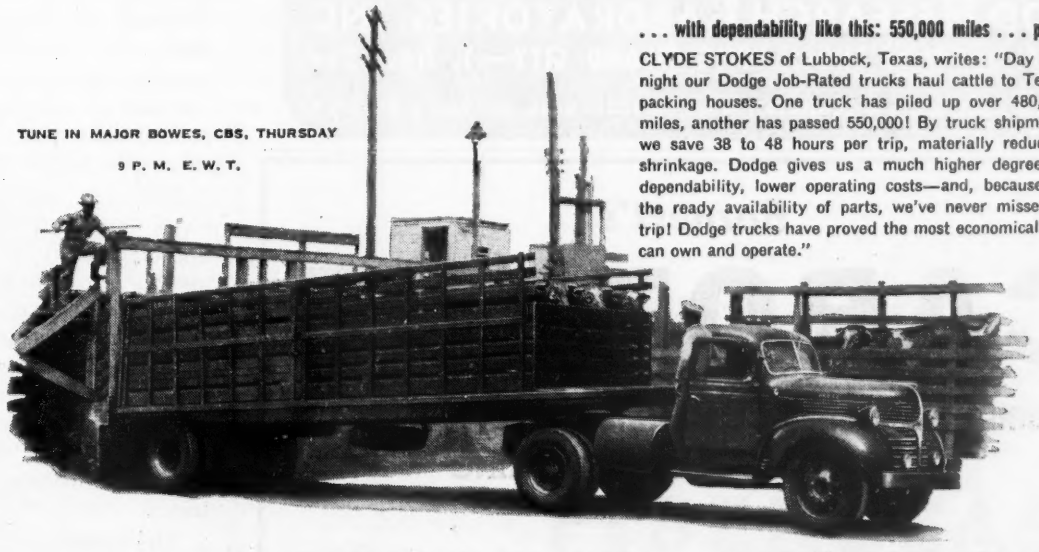

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sire of such a person; to have been the father of Appert or Pasteur, of Sherman or Eddy, or Fred Blanck, and to have reared the promising, exigent child with a pepper grinder in one hand and a test tube in the other. A person such as I have in mind, a just blend of fact and of fancy, of creative and imaginative art, and of careful chemistry, might well justify the title of this thesis—The Religion, or the Philosophy of a Cook. To me, you scientists are, or should be in your chosen field, like men on horseback in shining armor. Perhaps you should carry a few herbs and a little spice in your saddlebags. The humble Indian tilling his acre of corn or beans in sun-drenched Sonora, raises his eyes to such as you as you ride by and piously says, as I now say in farewell—*Vaya con Dios*, Go with God.

The Stinkometer —A New Tool

(Continued from page 79)

of the potassium permanganate, which is expressed as microequivalents of reduction. Operational details connected with the use of this method and the superiority of alkaline over acid permanganate as an oxidizing reagent have been previously reported.[1, 2]

The apparatus developed is shown in Figs. 1 and 2, in which a 5 ml. sample of fish press juice is pipetted into the aeration chamber, *A*, and aerated with a measured volume of air. The effluent is passed through the reaction vessels *T*-1 and *T*-2 each containing 10 ml. of 0.1 N potassium permanganate in N sodium hydroxide solution. The glassware designed for the test and the equipment for obtaining press juice samples are shown in Figs. 3 and 4. Because of frothing of some samples, it was necessary to insert the two bulbs on the aeration vessel *A*.

Although repeated experiments have demonstrated the efficacy of organoleptic judgment in detecting increases in volatile substances during progressive spoilage, such changes in volatile constituents, indicative of incipient spoilage, which are imperceptible to the sense of smell, are clearly observed with this apparatus. The data presented in Table I illustrate a typical experiment.

The sensitivity shown by this method of determination is exemplified by the fact that dilute solutions

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Fuel shortages are anticipated again this winter. Once more the Government urges that every possible measure be taken to reduce waste and inefficiency in heating. And one sure, practical step toward the performance of this patriotic duty is through thorough and adequate insulation with Fiberglas Industrial Insulations.

In co-operation with the Government program to save critical fuel.

Yes, any part of any pipe or duct—any boiler, retort, heat exchanger or oven in your plant—that is "too hot to touch" is wasting war-essential fuel and costing you money. Just how much, it might surprise you to learn!

The significant fuel savings effected by Fiberglas Insulations can be seen at a glance on the Fuel Saver Calculator shown above. For example, 2-inch thick Fiberglas PF Pipe Insulation, on 100 feet of 4-inch pipe with a hot-face temperature of 400° F. in an 80° F. surrounding temperature, will save nearly 70 tons of coal a year. And just imagine the costly extra burden such heat losses also put upon air conditioning equipment!

This practical and useful vest-pocket device is yours for the asking. Write for your Calculator today, make a thorough inspection of your plant and add up the amount of fuel proper insulation could save. Then support the National Fuel Efficiency Program—and reduce your plant operating costs—by applying Fiberglas Industrial Insulations wherever there is a spot "too hot to touch".

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1. PF Pipe Insulation—A lightweight, preformed pipe covering with high insulating efficiency for temperatures up to 600° F. Made in 3-ft. sections or segments for all standard pipe sizes. Fibrous ends of sections intermesh to form tight joints.

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3. Metal Mesh Blankets—With mesh wire or expanded metal on one or both sides. Lightweight, and easily applied. 2 ft. x 4 ft. and 2 ft. x 8 ft. In standard thicknesses. Two types: For temperatures up to 600° F. and 1000° F.

4. No. 600 PF Block—Same materials as in PF Pipe Covering—in blocks 6" x 36" and 12" x 36", standard thicknesses.

5. OC-1800 High Temperature Block—A highly efficient and rugged molded block in sizes 3" x 18" and 6" x 36" and 12" x 36"—in standard thicknesses. Will withstand surface temperatures up to 1800° F.

6. Insulating Cement—For insulating fittings, valves and all irregular surfaces. Highly efficient . . . withstands temperatures up to 1200° Fahrenheit.

7. OC Mastic Finish—An asphalt emulsion cement for insulated pipe and equipment exposed to outdoor or high moisture conditions.

8. Insulating Wool, Type TW-F—Fabricated in bats, rolls and bulk. Used for drying-ovens, heaters, etc., for filling irregular spaces.

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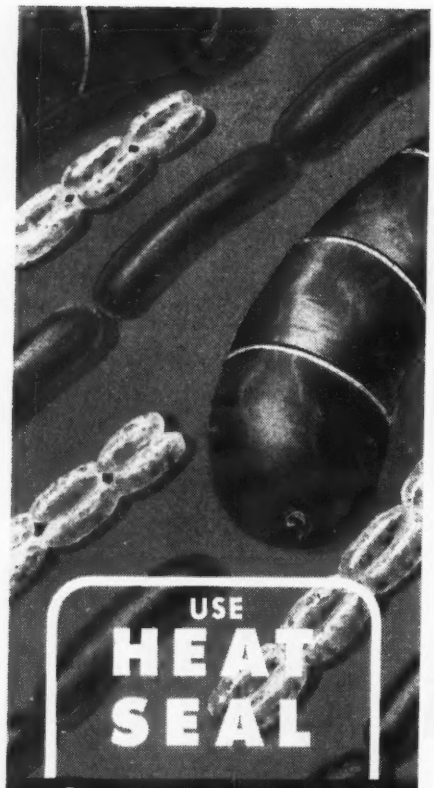

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of ethyl alcohol of the order of 0.001 percent (by volume), having no obvious odor, give measurable reduction values.

While the determination was primarily designed for the evaluation of incipient and progressive spoilage in fish and fish products, it became evident during the experiments that this method is essentially a means for the quantitative evaluation of odors in any product or substance in which good or bad odors are an important determinant of quality.

The increase in odors of other foods, such as meats, prunes and raisins, which were held under unfavorable storage conditions, have been quantitatively determined. And diametrically, the method has been used with success in estimating the loss of aroma in such products as coffee, spices, pepper and some perfumes.

The species of fish upon which progressive spoilage experiments were carried out include Bluefin (*Thunnus thynnus*), Yellowfin (*Neothunnus macropterus*), Striped Tuna (*Katsuwonus pelamis*) and Pacific Mackerel.

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Role of Research In National Defense

(*Continued from page* 89)

our resources of technical skills and our laboratory and factory facilities.

With no two points on the globe further apart than 60 hours by air, we shall have no leisure for bumbling next time. We must be prepared to hurl our hard-hitting teams of scientists, executives and production men into the battle with the same speed that our bombers take the air. If this is to be possible, now is the time when we must begin to overhaul our selective service laws for the future.

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ice Law and however well-intentioned those who have administered it, the blunt fact known to us all is that too many of our young chemists, physicists and engineers have been put into uniform and lost to war research and industry before endless red tape could be unwound.

Activities valuable to the war should not have had to ask for the deferment of a single technical man. Rather, their technical men, regardless of their desires, should, if necessary, be barred from the privilege of fighting and retained instead for the essential tasks of technological war where only they can serve their country.

Must Continue Research

Now, while we are in the midst of a war in which new weapons are born and become obsolete overnight, it is clear and plain to us that we must keep research on weapons every up-to-date.

Yes, we must continue military research after the war. Military security forbids talking of potential secret weapons during war, even when it is common knowledge that the enemy is working along the same lines. However, the stupidest man must be impressed with the close parallelism of work done here and in Germany—as for example in jet-propelled aircraft. History will show that the work of units of the Office of Scientific Research and Development—led by Vannovar Bush—in the development of radar, amphibious vehicles, disease control, and many other instruments of war, already has determined many decisive battles of this war.

To stick our heads in the sand after the war and to fail to carry on unfinished developments of today's science may well give some enemy a chance to destroy overnight all that we are now fighting for. This would be suicidal folly.

In directing research upon new weapons, the Office of Scientific Research and Development has had great success because it has been able to call, in the name of patriotism, upon a great body of virile, independent research men from educational institutions.

Of course this setup should not, and cannot, continue after the war. These men must return to their institutions and to peacetime pursuits. But the government must find ways to carry on the work they have unfinished, as well as that research essential to the armed services which offers no hope of profit in peacetime.

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Dow Methyl Bromide is noted for its remarkable power of penetration—greater than any comparable product. It is effective for almost every type of food fumigation—warehouse, box car, tarpaulin, chamber.

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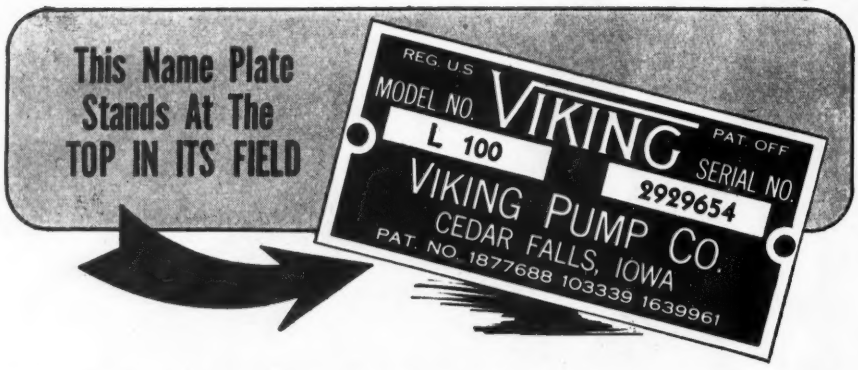

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America's Agar Making Industry

(*Continued from page* 81)

ports (1944), there are three companies on the Atlantic Coast now actively engaged in the commercial production of Gracilaria agar. The most active concern, which is located at Beaufort, is producing about 3,000 lb. per month. Another, located at Scituate, Mass., produced some agar in the early part of this year, also using the Beaufort agarphyte, but it has temporarily stopped making agar while experiments are being pursued on a new method of manufacture. The third concern is located in New York, N. Y., presumably utilizing Florida Gracilaria for its agar extraction, but it has not as yet put any agar on the market.

EDITOR'S NOTE: *Part I of this article on agar is principally in the nature of an introduction. Other parts to follow will cover the subject thoroughly to give a complete story of agar.*

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Nutrition Going Up

(*Continued from page* 87)

Higher incomes and nutrition education have combined to provide better nutrition for most persons in this country. There are still many, however, whose incomes have not risen while the cost of food has gone up. There are others who have not been reached, as yet, by nutrition education. It is apparent, therefore, that there can be no relaxation in the production of food and in the efforts to provide everyone with both the means and the knowledge to buy an adequate diet. If all families were to follow a moderate-cost food plan that would assure good nutrition, at least one-fifth more milk and citrus fruit and tomatoes would be needed than were available in 1943 and twice as great a quantity of green and yellow vegetables.